ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1899.

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APPENDIX I.—1899.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a list of seeds of Hardy Herbaceous Annual and Perennial Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1898. These seeds are not sold to the general public, but are available for exchange with Colonial, Indian, and Foreign Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of March.

HERBACEOUS PLANTS.

Acaena glabra, *J. Buch.*
  macrostemon, *Hook. f.*
  microphylla, *Hook. f.*
  myriophylla, *Lindl.*
  Novae-Zealandiae, *Kirk.*
  ovalifolia, *Ruiz & Pav.*
  pinnatifida, *Ruiz & Pav.*
  Sanguisorbae, *Vahl.*
  sarmentosa, *Carmich.*
  sericea, *Jacq.*

Acanthus longifolius, *Poir.*
  spinosus, *L.*

Achillea Ageratum, *L.*
  compacta, *Willd.*
  decolorans, *Schrad.*
  filipendulina, *Lam.*

Achillea, *cont.*
  leptophylla, *Bieb.*
  ligustica, *All.*
  magna, *L.*
  Millefolium, *L.*
  moschata, *Jacq.*
  nobilis, *L.*
  Ptarmica, *L.*
  ptarmicoides, *Maxim.*
  rupestris, *Huter.*
  Santolina, *L.*
  setacea, *Waldst. & Kit.*
  taygetea, *Boiss. & Heldr.*
  umbellata, *Sib. & Sm.*

Aconitum heterophyllum, *Wall.*

958—1375—11/98 Wt 90 D & S

Aconitum, *cont.*
Lycoctonum, *L.*
Napellus, *L.*
orientale, *Mill.*
uncinatum, *L.*

Actinolepis coronaria, *A. Gray.*

Actinomeris squarrosa, *Nutt.*

Adenophora liliifolia, *Bess.*

Adesmia muricata, *DC.*

Adonis aestivalis, *L.*
autumnalis, *L.*
pyrenaica, *DC.*

Aethionema cappadocicum, *Spreng.*
gracile, *DC.*
saxatile, *R. Br.*

Aethusa Cynapium, *L.*

Agrimonia Eupatoria, *L.*
leucantha, *Kunze.*
odorata, *Mill.*

Agropyron acutum, *Roem. & Schult.*
caninum, *Beauv.*
dasyanthum, *Ledeb.*
desertorum, *Schult.*
divergens, *Nees.*
pungens, *Roem. & Schult.*
repens, *Beauv.*
Richardsoni, *Schrad.*
tenerum, *Vasey.*
villosum, *Link.*

Agrostis alba, *L.*
alpina, *Scop.*
vulgaris, *With.*

Alchemilla alpina, *L.*
conjuncta, *Bab.*
fissa, *Schum.*
splendens, *Christ.*
vulgaris, *L.*

Alisma Plantago, *L.*

Allium angulosum, *L.*
atropurpureum, *Waldst. & Kit.*

Allium, *cont.*
Bidwilliæ, *S. Wats.*
cardiostemon, *Fisch. & Mey.*
carinatum, *L.*
cyaneum, *Regel.*
Cydni, *Schott & Kotschy.*
fistulosum, *L.*
giganteum, *Regel.*
globosum, *Red.*
hirtifolium, *Boiss.*
hymenorrhizum, *Ledeb.*
karataviense, *Regel.*
margaritaceum, *Sibth. & Sm.*
Moly, *L.*
narcissiflorum, *Vill.*
nigrum, *L.*
odorum, *L.*
oreophilum, *C. A. Mey.*
orientale, *Boiss.*
polyphyllum, *Kar. & Kir.*
Porrum, *L.*
pulchellum, *Don.*
rosenbachianum, *Regel.*
roseum, *L.*
Schoenoprasum, *L.*
— var. sibiricum, (*L.*).
scorzoneræfolium, *Red.*
senescens, *L.*
sphaerocephalum, *L.*
subhirsutum, *L.*
subvillosum, *Salzm.*
Suworowi, *Regel.*
triquetrum, *L.*
ursinum, *L.*

Alonsoa incisifolia, *Ruiz & Pav.*
Warscewiczii, *Regel.*

Alopecurus geniculatus, *L.*
pratensis, *L.*

Althaea armeniaca, *Tenore.*
cannabina, *L.* var. narbonensis, *Pourr.*
ficifolia, *Cav.*
kurdica, *Schlecht.*
Ludwigii, *L.*
officinalis, *L.*
pallida, *Waldst. & Kit.*
rosea, *Cav.*
taurinensis, *DC.*

Alyssum argenteum, *Vitm.*
corymbosum, *Boiss.*
creticum, *L.*

Alyssum, *cont.*
gemonense, *L.*
grandiflorum, *Hort. Kew.*
incanum, *L.*
maritimum, *Lam.*
montanum, *L.*
podolicum, *Bess.*
pyrenaicum, *Lap.*
saxatile, *L.*

Amaranthus caudatus, *L.*
hypochondriacus, *L.*
polygamus, *L.*
retroflexus, *L.*
speciosus, *Sims.*

Amethystea caerulea, *L.*

Ammi majus, *L.*

Ammobium alatum, *R. Br.*

Ammophila arundinacea, *Host.*

Amsonia Tabernaemontana, *Walt.*

Anacyclus radiatus, *Loisel.*

Anagallis arvensis, *L.*
linifolia, *L.*

Anchusa capensis, *Thunb.*
officinalis, *L.*

Andropogon cirratus, *Hack.*
provincialis, *Lam.*

Androsace filiformis, *Retz.*
macrantha, *Boiss. & Huet.*
nana, *Horn.*

Andryala ragusina, *L.*
varia, *Lowe.*

Anemone decapetala, *L.*
hortensis, *L.*
multifida, *Poir.*
nemorosa, *L.*
pennsylvanica, *L.*
Pulsatilla, *L.*
rivularis, *Buch-Ham.*
sylvestris, *L.*

Angelica dahurica, *Maxim.*

Anoda hastata, *Cav.*
Wrightii, *Gray.*

Antennaria dioica, *Gaertn.* var. tomentosa, *Hort.*

Anthemis aetnensis, *Schouw.*
arvensis, *L.*
Chia, *L.*
cinerea, *Panc.*
Cotula, *L.*
cupaniana, *Tod.*
montana, *L.*
nobilis, *L.*
— var. discoidalis, *Hort.*
styriaca, *Vest.*
tinctoria, *L.*

Anthericum Liliago, *L.*
— var. algeriense, *B. & R.*
ramosum, *L.*

Anthoxanthum odoratum, *L.*

Anthyllis Vulneraria, *L.* var. Dillenii.

Antirrhinum Asarina, *L.*
majus, *L.*
Orontium, *L.*
rupestre, *Boiss. & Reut.*

Apera interrupta, *Beauv.*

Aplopappus Greenei, *A. Gray,* var mollis, *A. Gray.*
rubiginosus, *Torr. & Gray.*

Aquilegia canadensis, *L.*
chrysantha, *A. Gray.*
glandulosa, *Fisch.*
sibirica, *Lam.*
vulgaris, *L.*

Arabis albida, *Stev.*
bellidifolia, *L.*
hirsuta, *Scop.*
Holboellii, *Hornem.*
pumila, *Jacq.*
Soyeri, *Reut. & Huet.*

Aralia cordata, *Thunb.*

Archangelica officinalis, *Hoffm.*

Arctium majus, *Bernh.*
minus, *Bernh.*

Arenaria aretioides, *Portenschl.*
balearica, *L.*
capillaris, *Poir.*
fasciculata, *Gouan.*
gothica, *Fries.*
graminifolia, *Schrad.*
— var. multiflora.

Arenaria, *cont.*
    gypsophiloides, *L.*
    pinifolia, *Bieb.*
    purpurascens, *Ramond.*
    serpyllifolia, *L.*

Argemone mexicana, *L.*

Arisarum proboscidium, *Savi.*

Armeria argyrocephala, *Wallr.*
    elongata, *Hoffm.*
    latifolia, *Willd.*
    maritima, *Willd.*
    plantaginea, *Willd.*
    Welwitschii, *Boiss.*

Arnica Chamissonis, *Less.*
    sachalinensis, *A. Gray.*

Arrhenatherum avenaceum, *Beauv.*

Artemisia Absinthium, *L.*
    annua, *L.*
    canadensis, *Michx.*
    glauca, *Pall.*
    paniculata, *Lam.*
    parviflora, *Buch-Ham.*
    pectinata, *Pall.*
    rupestris, *L.*

Arum italicum, *Mill.*

Asarum europaeum, *L.*
    Hartwegii, *Wats.*

Asparagus officinalis, *L.*

Asperella hystrix, *Willd.*

Asperula azurea, *Jaub. & Spach.*
    galioides, *Bieb.*
    tinctoria, *L.*

Asphodeline liburnica, *Reichb.*

Asphodelus albus, *Willd.*

Aster acuminatus, *Michx.*
    alpinus, *L.*
    altaicus, *Willd.*
    Amellus, *L.*
    corymbosus, *Ait.*
    Curtisii, *A. Gray.*
    dahuricus, *Benth.*
    glaucus, *Torr. & Gray.*
    Novi-Belgii, *L.*

Aster, *cont.*
    polyphyllus, *Willd.*
    ptarmicoides, *Torr. & Gray.*
    puniceus, *L.*
    — var. lucidulus, *Gray.*
    pyrenaeus, *DC.*
    Radula, *Ait.*
    scaber, *Thunb.*
    Shortii, *Lindl.*
    sibiricus, *L.*
    spectabilis, *Ait.*
    tanacetifolius, *H. B. & K.*
    trinervius, *Desf.*
    umbellatus, *Mill.*
    Vahlii, *Hook. & Arn.*

Astilbe rivularis, *Buch-Ham.*
    Thunbergii, *Miq.*

Astragalus adsurgens, *Pall.*
    alopecuroides, *L.*
    alpinus, *L.*
    boeticus, *L.*
    chinensis, *L.*
    chlorostachys, *Lindl.*
    Cicer, *L.*
    danicus, *Retz.*
    frigidus, *A. Gray.*
    glycyphyllus, *L.*
    graecus, *Boiss.*
    kahiricus, *DC.*
    monspessulanus, *L.*
    pentaglottis, *L.*
    ponticus, *Pall.*
    reflexistipulus, *Miq.*
    tibetanus, *Benth.*

Astrantia major, *L.*
    —var. carinthiaca, (*Hoppe.*)

Astrocarpus Clusii, *Gay.*

Athamanta Matthioli, *Wulf.*

Atriplex hastata, *L.*
    hortensis, *L.*
    littoralis, *L.*
    rosea, *L.*
    sibirica, *L.*

Atropa Belladonna, *L.*

Aubrietia deltoidea, *DC.*
    gracilis, *Sprun.*

Avena distichophylla, *Vill.*

Avena, *cont.*
pubescens, *Huds.*
sempervirens, *Vill.*
strigosa, *Schreb.*

Baeria chrysostoma, *Fisch. & Mey.*
coronaria, *A. Gray.*
gracilis, *A. Gray.*

Ballota hispanica, *Benth.*

Baptisia australis, *R. Br.*

Basella rubra, *L.*

Beckmannia erucaeformis, *Host.*

Berkheya Adlami, *Hook. f.*
,, purpurea, *Benth. & Hook. f.*

Beta maritima, *L.*
trigyna, *Waldst. & Kit.*
vulgaris, *L.*

Bidens cernua, *L.*
frondosa, *L.*
grandiflora, *Balb.*
leucantha, *Willd.*
tripartita, *L.*

Biscutella auriculata, *L.*
ciliata, *DC.*
didyma, *L.*

Blumenbachia insignis, *Schrad.*

Bocconia cordata, *Willd.*
microcarpa, *Maxim.*

Boltonia asteroides, *L'Herit.*
incisa, *Benth.*
indica, *Benth.*

Borago officinalis, *L.*

Bouteloua oligostachya, *Torr.*
racemosa, *A. Rich.*

Boykinia rotundifolia, *Parry.*

Brachypodium distachyum. *Beauv.*
pinnatum, *Beauv.*
sylvaticum, *R. & S.*

Brassica campestris, *L.*
— var. chinensis, (*L.*).
— var. glauca.
Cheiranthos, *Vill.*

Brassica, *cont.*
Erucastrum, *L.*
juncea, *Coss.*
nigra, *Koch.*
oleracea, *L.*

Briza media, *L.*
minor, *L.*

Brodiaea grandiflora, *Sm.*
lactea, *S. Wats.*
peduncularis, *S. Wats.*
uniflora, *Baker.*

Bromus adoënsis, *Hochst.*
albidus, *Bieb.*
breviaristatus, *Buckl.*
brizaeformis, *Fisch. & Mey.*
carinatus, *Hook. & Arn.*
ciliatus, *L.*
erectus, *Huds.*
inermis, *Leyss.*
Kalmii, *A. Gray.*
macrostachys, *Desf.*
madritensis, *L.*
maximus, *Desf.*
— var Gussonei, (*Parl.*).
mollis, *L.*
sterilis, *L.*
Tacna, *Steud.*
tectorum, *L.*
unioloides, *H. B. & K.*

Browallia viscosa, *H. B. & K.*

Bryonia dioica, *Jacq.*

Bulbine annua, *Willd.*

Bulbinella Hookeri, *Benth. & Hook. f.*

Bunias Erucago, *L.*
orientalis, *L.*

Buphthalmum grandiflorum, *L.*
speciosum, *Schreb.*

Bupleurum aureum, *Fisch.*
Candollei, *Wall.*
croceum, *Fenzl.*
gracile, *DC.*
longifolium, *L.*
protractum, *Hoffmg. & Lk.*
rotundifolium, *L.*
stellatum, *L.*

Butomus umbellatus, *L.*

Cakile maritima, *Scop.*

Calamagrostis confinis, *Nutt.*
epigeios, *Roth.*
lanceolata, *Roth.*
varia, *Beauv.*

Calamintha Acinos, *Clairv.*
chinensis, *Benth.*
Clinopodium, *Benth.*
grandiflora, *Moench.*
officinalis, *Moench.*

Calandrinia grandiflora, *Lindl.*
Menziesii, *Torr. & Gray.*
pilosiuscula, *DC.*
umbellata, *DC.*

Calceolaria mexicana, *Benth.*

Calendula arvensis, *L.*
microphylla, *Lange.*
officinalis, *L.*
suffruticosa, *Vahl.*

Callirhöe pedata, *A. Gray.*

Callistephus hortensis, *Cass.*

Caltha palustris, *L.*
polypetala, *Hochst.*

Camassia Cusickii, *S. Wats.*
esculenta, *Lindl.*
Fraseri, *Torr.*

Camelina sativa, *Crantz.*

Campanula alliariaefolia, *Willd.*
barbata, *L.*
bononiensis, *L.*
carpatica, *Jacq.*
— var. alba.
cervicaria, *L.*
collina, *Bieb.*
colorata, *Wall.*
drabaefolia, *Sibth. & Sm.*
— var. alba.
— var. attica, (*Boiss. & Heldr.*).
Erinus, *L.*
excisa, *Schleich.*
glomerata, *L.*
lactiflora, *Bieb.*
latifolia, *L.*
— var. macrantha, (*Fisch.*).
— var. versicolor, (*Sibth. & Sm.*).
latiloba, *DC.*

Campanula, *cont.*
Loreyi, *Pollini.*
macrostyla, *Boiss.*
persicifolia, *L.*
primulæfolia, *Brot.*
punctata, *Lam.*
pusilla, *Haenke.*
pyramidalis, *L.*
ramosissima, *Sibth. & Sm*
rapunculoides, *L.*
reuteriana, *Boiss. & Bal.*
rhomboidalis, *L.*
rotundifolia, *L.*
sarmatica, *Ker.*
Scheuchzeri, *Vill.*
sibirica, *L.*
— var. divergens, (*Willd.*).
spicata, *L.*
Steveni, *Bieb.*
thyrsoides, *L.*
Trachelium, *L.*

Cannabis sativa, *L.*

Carbenia benedicta, *Adans.*

Cardamine chenopodifolia, *Pers.*
graeca, *L.*
latifolia, *Vahl.*

Carduus crispus, *L.*
nutans, *L.*
stenolepis, *Benth.*

Carex adusta, *Boott.*
alopecoidea, *Tuckerm.*
arenaria, *L.*
axillaris, *Good.*
binervis, *Sm.*
crinita, *Lam.*
Crus-corvi, *Shuttl.*
decomposita, *Muhl.*
depauperata, *Good.*
divulsa, *Good.*
flava, *L.*
— var. lepidocarpa, (*Tausch.*).
— var. Oederi, (*Ehrh.*).
— var. viridula.
fusca, *All.*
hirta, *L.*
hordeistichos, *Vill.*
leporina, *L.*
paniculata, *L.*
pendula, *Huds.*
punctata, *Gaud.*

Carex, *cont.*
rariflora, *Sm.*
sparganioides, *Muhl.*
stellulata, *Good.*
strigosa, *Huds.*
sylvatica, *Huds.*
teretiuscula, *Good.*
tribuloides, *Wahlenb.*
vulpina, *L.*
vulpinoidea, *Michx.*

Carrichtera Vellae, *DC.*

Carthamus flavescens, *Willd.*
lanatus, *L.*
leucocaulos, *Sibth. & Sm.*
tinctorius, *L.*

Carum Carvi, *L.*
copticum, *Benth. & Hook. f.*
Petroselinum, *Benth. & Hook. f.*

Catananche caerulea, *L.*

Cedronella mexicana, *Benth.* var. cana, *Hook.*

Celsia pontica, *Boiss.*

Cenchrus tribuloides, *L.*

Cenia turbinata, *Pers.*

Centaurea axillaris, *Willd.*
Clementei, *Boiss.*
Crocodylium, *L.*
Cyanus, *L.*
cynaroides, *Link.*
diluta, *Dryand.*
eriophora, *L.*
Fontanesii, *Spach.*
glastifolia, *L.*
gymnocarpa, *Moris.*
Jacea, *L.*
melitensis, *L.*
montana, *L.*
— var. alba.
nigra, L.
nigrescens, *Willd.*
—var. vochinensis (*Bernh.*).
phrygia, *L.*
ruthenica, *Lam.*
salmantica, *L.*
Scabiosa, *L.*
— var. olivieriana, (*DC.*).
Verutum, *L.*

Centranthus Calcitrapa, *Dufr.*
macrosiphon, *Boiss.*
ruber, *DC.*

Cephalaria alpina, *Schrad.*
leucantha, *Schrad.*
radiata, *Griseb. & Schenk.*
syriaca, *Schrad.*
tatarica, *Schrad.*
transsylvanica, *L.*

Cerastium alpinum, *L.* var. lanatum, (*Lam.*).
— var. villosum, (*Baumg.*).
arvense, *L.*
latifolium, *L.*
macranthum, *Boiss.*
perfoliatum, *L.*
purpurascens, *Adams.*

Cerinthe alpina, *Kit.*
aspera, *Roth.*
major, *L.*
retorta, *Sibth. & Syme.*

Chaenostoma foetida, *Benth.*

Chaerophyllum aromaticum, *L.*
aureum, *L.*

Charieis heterophylla, *Cass.*

Cheiranthus Cheiri, *L.*

Chelidonium majus, *L.*
— var. laciniatum.

Chelone Lyoni, *Pursh.*
nemorosa, *Dougl.*
obliqua, *L.*

Chenopodium album *L.*
ambrosoides, *L.*
Bonus-Henricus, *L.*
Botrys, *L.*
ficifolium, *Sm.*
graveolens, *Willd.*
polyspermum, *L.*
Quinoa, *Willd.*
urbicum, *L.*
virgatum, *Thunb.*
Vulvaria, *L.*

Chionodoxa Luciliae, *Boiss.*
— var. sardensis.

Chlorogalum pomeridianum, *Kunth.*

Chorispora tenella, *DC.*

Chrysanthemum anserinaefolium, *Hausskn. & Bornm.*
carneum, *Steud.*
caucasicum, *Pers.*
cinerariaefolium, *Vis.*
coccineum, *Willd.*
coronarium, *L.*
corymbosum, *L.*
lacustre, *Brot.*
Leucanthemum, *L.*
maximum, *Ramond.*
macrophyllum, *Waldst. & Kit.*
multicaule, *Desf.*
pallens, *J. Gay.*
Parthenium, *Bernh.*
segetum, *L.*
setabense, *Dufour.*
viscosum, *Desf.*

Chrysopogon Gryllus, *Trin.*

Cichorium Intybus, *L.*

Cimicifuga cordifolia, *Pursh.*
racemosa, *Nutt.*

Circaea lutetiana, *L.*

Cladium Mariscus, *Br.*

Clarkia elegans, *Dougl.*
pulchella, *Pursh.*
— var. alba.
rhomboidea, *Dougl.*

Claytonia perfoliata, *Donn.*
sibirica, *L.*

Cleome violacea, *L.*

Cleonia lusitanica, *L.*

Clintonia uniflora, *Kunth.*

Clypeola cyclodontea, *Delile.*

Cnicus Acarna, *L.*
altissimus, *Willd.*
canus, *Roth.*
Diacantha, *Desf.*
eriophorus, *Roth.*
monspessulanus, *L.*
ochroleucus, *Spreng.*
oleraceus, *L.*

Cnicus, *cont.*
serrulatus, *Bieb.*
syriacus, *Roth.*
tataricus, *Willd.*

Cochlearia danica, *L.*
glastifolia, *L.*
officinalis, *L.*

Codonopsis ovata, *Benth.*

Coix Lacryma-Jobi, *L.*

Collinsia arvensis, *Greene.*
bartsiaefolia, *Benth.*
bicolor, *Benth.*
Parryi, *A. Gray.*
sparsiflora, *Fisch. & Mey.*
verna, *Nutt.*

Collomia coccinea, *Lehm.*
gilioides, *Benth.*
grandiflora, *Dougl.*
linearis, *Nutt.*

Commelina coelestis, *Willd.*

Conium maculatum, *L.*

Conringia orientalis, *Dum.*

Convolvulus pentapetaloides, *L.*
siculus, *L.*
tricolor, *L.*
undulatus, *Cav.*

Corchorus olitorius, *Willd.*

Coreopsis auriculata, *L.*
Drummondi, *Torr. & Gray.*
grandiflora, *Nutt.*
lanceolata, *L.*
tinctoria, *Nutt.*

Corispermum hyssopifolium, *L.*

Coronilla atlantica, *Boiss. & Reut.*
cappadocica, *Willd.*
elegans, *Panc.*
vaginalis, *Lam.*
varia, *L.*

Corrigiola littoralis, *L.*

Cortusa Matthioli, *L.*

Corydalis capnoides, *Wahlenb.*
claviculata, *DC.*

Corydalis, *cont.*
glauca, *Pursh.*
lutea, *DC.*
racemosa, *Pers.*
sibirica, *Pers.*

Corynephorus canescens, *Beauv.*

Cosmidium burridgeanum, *Hort.*

Cosmos bipinnatus, *Cav.*

Cotula coronopifolia, *L.*

Cotyledon lusitanicus, *Lam.*
Umbilicus, *L.*

Crambe hispanica, *L.*

Crepis alpina, *L.*
aurea, *Reichb.*
blattarioides, *Vill.*
grandiflora, *Tausch.*
hyoseridifolia, *Reichb.*
paludosa, *Moench.*
rubra, *L.*
setosa, *Hall. f.*
sibirica, *L.*
taraxacifolia, *Thuill.*
tectorum, *L.*

Crocus biflorus, *Mill.*
cancellatus, *Herb.* var. cilicicus, *Maw.*
dalmaticus, *Vis.*
Imperati, *Tenore.*
medius, *Balb.*
Sieberi, *Gay.*
speciosus, *Bieb.*
susianus, *Ker-Gawl.*
tommasinianus, *Herb.*
vernus, *All.*
zonatus, *Gay.*

Crucianella aegyptiaca, *L.*

Crupina vulgaris, *Cass.*

Cryptostemma calendulaceum, *R.Br.*

Cucubalus bacciferus, *L.*

Cucurbita Pepo, *L.*

Cuminum Cyminum, *L.*

Cuphea Llavea, *Lindl.*
pinetorum, *Benth.*

Cuphea, *cont.*
procumbeus, *Cav.*
Zimapani, *Morr.*

Cyclànthera explodens, *Naud.*

Cynara Cardunculus, *L.*
Scolymus, *L.*

Cynodon Dactylon, *Pers.*

Cynoglossum furcatum, *Wall.*
nervosum, *Benth.*
petiolatum, *A. DC.*
pictum, *Ait.*

Cynosurus cristatus, *L.*

Cyperus esculentus, *L.*
longus, *L.*
vegetus, *Willd.*

Dactylis glomerata, *L.*

Dahlia coccinea, *Cav.*
Merckii, *Lehm.*

Datura Stramonium, *L.*
Tatula, *L.*

Daucus Carota, *L.*
gummifer, *Lam.*
pusillus, *Michx.*

Delphinium Ajacis, *Reichb.*
cashmirianum, *Royle.*
caucasicum, *C. A. Mey.*
decorum, *Fisch. & Mey.*
dictyocarpum, *DC.*
elatum, *L.*
— var. alpinum, (*Waldst. & Kit.*)
formosum, *Boiss. & Huet.*
grandiflorum, *L.*
hybridum, *Steph.*
maackianum, *Regel.*
Menziesii, *DC.*
montanum, *DC.*
orientale, *J. Gay.*
speciosum, *Bieb.*
— var. turkestanicum.
Staphisagria, *L.*
tatsienense, *Franch.*
vestitum, *Wall.*

Demazeria loliacea, *Nym.*
sicula, *Dum.*

Deschampsia caespitosa, *Beauv.*

Desmodium canadense, *DC.*

Dianthus arenarius, *L.*
Armeria, *L.*
atrorubens, *All.*
barbatus, *L.*
— var. latifolius, (*Willd.*).
caesius, *Sm.*
capitatus, *DC.*
carthusianorum, *L.*
Caryophyllus, *L.*
chinensis, *L.*
ciliatus, *Guss.*
deltoides, *L.*
fragrans, *Bieb.*
giganteus, *Urv.*
hirtus, *Vill.*
monspessulanus, *L.*
petraeus, *Waldst. & Kit.*
plumarius, *L.*
pungens, *L.*
Requienii, *Gren. & Godr.*
Seguieri, *Vill.*
sylvestris, *Wulf.*
Waldsteinii, *Sternb.*

Dictamnus albus, *L.*

Dierama pulcherrimum, *Baker.*

Digitalis ambigua, *Murr.*
laevigata, *Waldst. & Kit.*
lanata, *Ehrh.*
lutea, *L.*
purpurea, *L.*
Thapsi, *L.*

Dimorphotheca annua, *Less.*
hybrida, *DC.*
pluvialis, *Moench.*

Dipcadi serotinum, *Medic.*

Diplachne fusca, *Beauv.*

Diplotaxis siifolia, *Kunze.*
tenuifolia, *DC.*

Dipsacus asper, *Wall.*
atratus, *Hook. f. & Thoms.*
ferox, *Loisel.*
fullonum, *L.*
japonicus, *Miq.*
laciniatus, *L.*
plumosus, *Franch.*
sylvestris, *Mill.*

Dischisma arenarium, *E. Mey.*
spicatum, *Chois.*

Doronicum scorpioides, *Lam.*

Dorycnium herbaceum, *Vill.*

Downingia elegans, *Torr.*

Draba aizoides, *L.*
Aizoon, *Wahlnb.*
altaica, *Bunge.*
arabisans, *Michx.*
carinthiaca, *Hoppe.*
frigida, *Saut.*
hirta, *L.*
hispida, *Willd.*
incana, *L.*
— var. stylaris.
Kotschyi, *Stur.*
lactea, *Adams.*
rigida, *Willd.*
stellata, *Jacq.*

Dracocephalum grandiflorum, *L.*
heterophyllum, *Benth.*
Moldavica, *L.*
parviflorum, *Nutt.*
peregrinum, *L.*

Dryas octopetala, *L.*

Drymaria cordata, *Willd.*

Drypis spinosa, *L.*

Dulichium spathaceum, *Rich.*

Eatonia obtusata, *A. Gray.*

Ecballium Elaterium, *A. Rich.*

Echinodorus ranunculoides, *Engelm.*

Echinops bannaticus, *Rochel.*
globifer, *Janka.*
sphaerocephalus, *L.*
— var. albidus, (*Boiss. & Sprun.*).

Echium rosulatum, *Lange.*
vulgare, *L.*

Eclipta alba, *Hassk.*

Eleusine coracana, *Gaertn.*
stricta, *Roxb.*

Elsholtzia cristata, *Willd.*

Elymus arenarius, *L.*
canadensis, *L.*

Elymus, *cont.*
— var. glaucifolius, *A. Gray.*
giganteus, *Vahl.*
sibiricus, *L.*
virginicus, *L.*

Emilia flammea, *Cass.*

Encelia subaristata, *A. Gray.*

Epilobium angustifolium, *L.*
— var. alba.
billardierianum, *Ser.*
Dodonaei, *Vill.*
glabellum, *Forst.*
hirsutum, *L.*
japonicum, *Haussk.*
Lamyi, *Schultz.*
linnaeoides, *Hook. f.*
luteum, *Pursh.*
montanum, *L.*
nummularifolium, *A. Cunn.*
roseum, *Schreb.*
rosmarinifolium, *Haenke.*
tetragonum, *L.*

Eragrostis minor, *Host.*
pectinacea, *Nees.*
pilosa, *L.*
Purshii, *Schrad.*
tenuis, *A. Gray.*

Eranthis hyemalis, *Salisb.*

Eremostachys laciniata, *Bunge.*

Eremurus kaufmanniana, *Regel.*
robustus, *Regel.*

Erigeron bellidifolius, *Muhl.*
compositus, *Pursh.*
glabellus, *Nutt.*
— var. asper.
macranthus, *Nutt.*
mucronatus, *DC.*
multiradiatus, *Benth. & Hook. f.*
speciosus, *DC.*
strigosus, *Muhl.*
uniflorus, *L.*

Erinus alpinus, *L.*

Eriophorum angustifolium, *Roth.*

Erodium alsinefolium, *Delil.*
chium, *Willd.*
ciconium, *Willd.*
cicutarium, *L'Herit.*
gruinum, *Soland.*
macradenum, *L'Herit.*
malacoides, *Willd.*
Salzmanni, *Del.*
Semenovii, *Regel.*
serotinum, *Stev.*
tmoleum, *Reut.*

Eruca sativa, *Mill.*

Eryngium alpinum, *L.*
amethystinum, *L.*
Bourgati, *Gouan.*
bromeliæfolium, *Delar.*
campestre, *L.*
giganteum, *Bieb.*
maritimum, *L.*
oliverianum, *Delar.*
planum, *L.*
vesiculosum, *Labill.*

Erysimum asperum, *DC.*
boryanum, *Boiss.*
hieracifolium, *L.*
perowskianum, *Fisch. & Mey.*

Erythraea Centaurium, *Pers.*
linariifolia, *Pers.*
ramosissima, *Pers.*

Eschscholzia californica, *Cham.*
— var. caespitosa, *Brewer.*

Eucharidium Breweri, *Gray.*
concinnum, *Fisch. & Mey.*
— var. grandiflorum.

Eupatorium ageratoides, *L.*
cannabinum, *L.*
purpureum, *L.*
serotinum, *Michx.*
sessilifolium, *L.*

Euphorbia coralloides, *L.*
dentata, *Michx.*
dictyosperma, *Fisch.*
Esula, *L.*
exigua, *L.*
hierosolymitana, *Boiss.*
Lagascae, *Spreng.*
Myrsinites, *L.*
palustris, *L.*
Peplis, *L.*

Euphorbia, *cont.*
pilosa, *L.*
portlandica, *L.*
segetalis, *L.*
spinosa, *L.*
stricta, *L.*
virgata, *Waldst. & Kit.*

Fagopyrum esculentum, *Moench.*

Fedia Cornucopiae, *Gaertn.*

Felicia fragilis, *Cass.*

Ferula communns, *L.*
Ferulago, *L.*
glauca, *L.*
— var. candelabra, *Heldr.*
Narthex, *Boiss.*
nodiflora, *L.*
persica, *Willd.*
tingitana, *L.*

Festuca arundinacea, *Vill.*
bromoides, *L.*
capillifolia, *Dufour.*
duriuscula, *L.*
elatior, *L.*
— var. pratensis, (*Huds*).
gigantea, *Vill.*
Halleri, *All.*
heterophylla, *Lam.*
montana, *Steud.* var. altissima, *Boiss.*
Myuros, *L.*
rigida, *Kunth.*
nnilaterale, *Schrad.*

Foeniculum vulgare, *Mill.*

Fragaria indica, *Andr.*

Fritillaria acmopetala, *Boiss.*
armena, *Boiss.*
citrina, *Baker.*
imperialis, *L.*
lutea, *Mill.*
Meleagris, *L.*
pallidiflora, *Schrenk.*
pluriflora, *Torr.*

Froelichia floridana, *Moq.*

Fumaria anatolica, *Boiss.*
capreolata, *L.*
officinalis, *L.*

Funkia ovata, *Spreng.*
sieboldiana, *Hook.*

Gahnia xanthocarpa, *Hook.*

Gaillardia aristata, *Pursh.*

Galanthus Elwesii, *Hook. f.*

Galega officinalis, *L.*
orientalis, *Lam.*

Galeopsis pyrenaica, *Bartl.*
Tetrahit, L.

Galinsoga brachystephana, *Regel.*
parviflora, *Cav.*

Galium Aparine, *L.*
boreale, *L.*
Mollugo, *L.*
recurvum, *Req.*
tenuissimum, *Bieb.*
tricorne, *Stokes.*

Gastridium australe, *Beauv.*

Gaudinia fragilis, *Beauv.*

Gaura Lindheimeri, *Engelm. & Gray.*
parviflora, *Dougl.*

Gentiana asclepiadea, *L.*
cruciata, *L.*
lutea, *L.*
septemfida, *Pall.*
tibetica, *King.*

Geranium albanum, *Bieb.*
anemonaefolium, *L'Herit.*
armenum, *Boiss.*
bohemicum, *L.*
collinum, *Steph.*
Endressi, *Gay.*
eriostemon, *Fisch.*
ibericum, *Cav.*
incisum, *Nutt.*
Londesii, *Fisch.*
lucidum, *L.*
maculatum, *L.*
pratense, *L.*
pusillum, *Burm. f.*
Richardsoni, *Fisch. & Trautv.*
rivulare, *Vill.*
rotundifolium, *L.*

Geranium, *cont.*
sanguineum, *L.*
sylvaticum, *L.*
wallichianum, *G. Don.*
Wilfordi, *Maxim.*
wlassovianum, *Fisch.*

Gerbera kunzeana, *A. Br. & Asch.*

Geum chiloense, *Balb.*
Heldreichii, *Hort.*
hispidum, *Fries.*
inclinatum, *Schleich.*
macrophyllum, *Willd.*
montanum, *L.*
parviflorum, *Sm.*
pyrenaicum, *Mill.*
strictum, *Ait.*
triflorum, *Pursh.*
urbanum, *L.*

Gilia achilleaefolia, *Benth.*
androsacea, *Steud.*
capitata, *Sims.*
densiflora, *Benth.*
dianthoides, *Endl.*
laciniata, *Ruiz & Pav.*
liniflora, *Benth.*
micrantha, *Steud.*
squarrosa, *Hook. & Arn.*
tricolor, *Benth.*

Gillenia trifoliata, *Moench.*

Gladiolus anatolicus, *Hort.*
atroviolaceus, *Boiss.*

Glaucium corniculatum, *Curt.*
flavum, *Crantz.* var. fulvum, (*Sm.*)
leptopodum, *Maxim.*

Glyceria aquatica, *Sm.*

Glycine Soja, *Sieb. & Zucc.*

Glycyrrhiza echinata, *L.*
lepidota, *Pursh.*

Gnaphalium indicum, *L.*
luteo-album, *L.*

Gratiola officinalis, *L.*

Grindelia inuloides, *Willd.*

Guizotia abyssinica, *Cass.*

Gunnera chilensis, *Lam.*
manicata, *Linden.*

Gypsophila libanotica, *Boiss.*
muralis, *L.*
paniculata, *L.*
Rokejeka, *Delile.*
Steveni, *Fisch.*

Hablitzia tamnoides, *Bieb.*

Hastingia alba, *S. Wats.*

Hebenstreitia comosa, *Hochst.*
tenuifolia, *Schrad.*

Hedysarum coronarium, *L.*
esculentum, *Ledeb.*
flexuosum, *L.*
microcalyx, *Baker.*
neglectum, *Ledeb.*
obscurum, *L.*
spinosissimum, *L.*

Helenium autumnale, *L.*
Bolanderi, *A. Gray.*
quadridentatum, *Labill.*

Heleochloa schoenoides, *Host.*

Helianthella quinquenervis, *Gray.*
uniflora, *Torr. & Gray.*

Helianthemum ledifolium, *Mill.*
salicifolium, *Mill.*
Tuberaria, *Mill.*
villosum, *Thib.*

Helianthus annuus, *L.*
argophyllus, *Torr. & Gray.*
debilis, *Nutt.*
laetiflorus, *Pursh.*

Helichrysum bracteatum, *Andr.*
lanatum, *DC.*
serotinum, *Boiss.*

Heliophila amplexicaulis, *L. f.*

Heliopsis laevis, *Pers.*

Heliotropium europaeum, *L.*

Helipterum anthemoides, *DC.*
humboldtianum, *DC.*
Manglesii, *F. Muell.*
roseum, *Benth.*

Helleborus colchicus, *Regel.*
orientalis, *Lam.*

Helonias bullata, *L.*
— var. latifolia.

Hemerocallis flava, *L.*
fulva, *L.*

Heracleum asperum, *Bieb.*
gummiferum, *Willd.*
lanatum, *Michx.*
Leichtlini, *Hort.*
pyrenaicum, *Lam.*
Sphondylium, *L.*
villosum, *Fisch.*

Herniaria glabra, *L.*
hirsuta, *L.*

Hesperis matronalis, *L.*

Heterospermum pinnatum, *Cav.*

Heterotheca Lamarckii, *Cass.*

Heuchera cylindrica, *Dougl.*
Drummondi, *Hort.*
glabra, *Willd.*
pilosissima, *Fisch. & Mey.*
sanguinea, *Engelm.*

HibiscusTrionum, *L.*

Hieracium alpinum, *L.*
amplexicaule, *L.*
aurantiacum, *L.*
bupleuroides, *C. C. Gmel.*
corymbosum, *Fries.*
crocatum, *Fries.*
Dewari, *Boswell.*
glaucum, *All.*
gymnocephalum, *Griseb.*
humile, *Jacq.*
juranum, *Fries.*
lanatum, *Waldst. & Kit.*
lactucaefolium, *Arv. Touv.*
murorum, *L.* var. integrifolium, (*Lange*).
norvegicum, *Fries.*
pallidum, *Biv.*
pannosum, *Boiss.*
rigidum, *Hartm.*
rupestre, *All.*
stoloniflorum, *Waldst. & Kit.*
umbellatum, *L.*

Hieracium, *cont.*
villosum, *Jacq.*
vulgatum, *Fries.*

Hilaria rigida, *Vasey.*

Hippocrepis multisiliquosa, *L.*

Hippuris vulgaris, *L.*

Holcus lanatus, *L.*

Hordeum bulbosum, *L.*
jubatum, *L.*
maritimum, *With.*
murinum, *L.*
secalinum, *Schreb.*

Horminum pyrenaicum, *L.*

Hosackia purshiana, *Benth.*

Humulus japonicus, *Sieb. & Zucc.*
— var. variegatus.

Hutchinsia petraea, *Br.*

Hyacinthus amethystinus, *L.*
romanus, *L.*

Hydrocotyle repanda, *Pers.*
vulgaris, *L.*

Hyoscyamus muticus, *L.*
niger, *L.*

Hypecoum grandiflorum, *Benth.*
procumbens, *L.*

Hypericum atomarium, *Boiss.*
Coris, *L.*
Gebleri, *C. A. Mey.*
montanum, *L.*
olympicum, *L.*
orientale, *L.* var. decussatum, (Kunze).
perforatum, *L.*
polyphyllum, *Boiss.*
pulchrum, *L.*
pyramidatum, *Ait.*
quadrangulum, *L.*
rhodopeum, *Friv.*
tomentosum, *L.*

Hypochoeris aetnensis, *Ces. Passer.*
glabra, *L.*

Hyssopus officinalis, *L.*
—var. aristatum, (*Jord.*).

Iberis amara, *L.*
pectinata, *Boiss.*
umbellata, *L.*
—var. carnea.

Impatiens amphorata, *Edgw.*
balsamina, *L.*
fulva, *Nutt.*
parviflora, *DC.*
Roylei, *Walp.*
scabrida, *DC.*

Inula barbata, *Wall.*
bifrons, *L.*
Conyza, *DC.*
ensifolia, *L.*
glandulosa, *Puschk.*
grandiflora, *Willd.*
Helenium, *L.*
hirta, *L.*
Hookeri, *C. B. Clarke.*
Roylei, *DC.*
salicina, *L.*
thapsoides, *Spreng.*

Ionopsidium albiflorum, *Dur.*

Ipomoea purpurea, *Lam.*
sinuata, *Orteg.*

Iris foetidissima, *L.*
graminea, *L.*
—var. latifolia, *Spach.*
laevigata, *Fisch.*
sibirica, *L.*
spuria, *L.*
—var. notha, (*Bieb.*).

Isatis glauca, *Auch.*
tinctoria, *L.*
Villarsii, *Gaud.*

Isopyrum fumarioides, *L.*

Iva xanthifolia, *Nutt.*

Jasione montana, *L.*
perennis, *Lam.*

Jasonia tuberosa, *L.*

Juncus alpinus, *Vill.*
balticus, *Willd.*
bufonius, *L.*
Chamissonis, *Kunth.*
compressus, *Jacq.*
effusus, *L.*

Juncus, *cont.*
glaucus, *Sibth.*
lamprocarpus, *Ehrh.*
maritimus, *Lam.*
tenuis, *Willd.*

Jurinea alata, *Cass.*
cyanoides, *DC.*

Kitaibelia vitifolia, *Willd.*

Kochia scoparia, *Schrad.*

Koeleria albescens, *DC.*
cristata, *Pers.*
phleoides, *Pers.*
setacea, *Pers.* var. valesiaca, (*Gaud.*).

Lactuca brevirostris, *Champ.*
muralis, *E. Mey.*
perennis, *L.*
Plumieri, *Gren. & Godr.*
saligna, *L.*
sativa, *L.*
Scariola, *L.*
virosa, *L.*

Lagenaria vulgaris, *Ser.*

Lallemantia canescens, *Fisch. & Mey.*
iberica, *Fisch. & Mey.*
peltata, *Fisch. & Mey.*

Lamarckia aurea, *Moench.*

Lapsana communis, *L.*

Lasiospermum radiatum, *Trevir.*

Lasthenia glabrata, *Lindl.*

Lathraea Squamaria, *L.*

Lathyrus angulatus, *L.*
annuus, *L.*
Aphaca, *L.*
articulatus, *L.*
Cicera, *L.*
Clymenum, *L.*
filiformis, *Gay.*
latifolius, *L.*
laetiflorus, *Greene.*
macrorrhizus, *Wimm.*
maritimus, *Bigel.*
montanus, *Bernh.*
niger, *Bernh.*

Lathyrus, *cont.*
Nissolia, *L.*
Ochrus, *DC.*
palustris, *L.*
rotundifolius, *Willd.*
sativus, *L.*
sphaericus, *Retz.*
sylvestris, *L.*
tingitanus, *L.*
tuberosus, *L.*
undulatus, *Boiss.*
variegatus, *Gren. & Godr.*
venosus, *Muhl.*

Lavatera cachemiriana, *Cambess.*
Olbia, *L.*
thuringiaca, *L.*
trimestris, *L.*

Layia Douglasii, *Hook. & Arn.*
elegans, *Torr. & Gray.*
platyglossa, *A. Gray.*

Lens esculenta, *Moench.*

Leontodon autumnalis, *L.*
crispus, *Vill.*
Ehrenbergii, *Hort. Kew.*
hastilis, *L.*
Leontopodium alpinum, *Cass.*

Leonurus Cardiaca, *L.*
sibiricus, *L.*

Lepidium Draba, *L.*
graminifolium, *L.*
incisum, *Roth.*
latifolium, *L.*
Menziesii, *DC.*
nebrodense, *Guss.*
sativum, *L.*
virginicum, *L.*

Leptosyne Douglasii, *DC.*
maritima, *A. Gray.*

Lepturus cylindricus, *Trin.*

Leucojum vernum, *L.*

Leuzea conifera, *DC.*

Liatris spicata, *Willd.*

Ligusticum alatum, *Spreng.*
pyrenaicum, *Gouan.*
Seguieri, *Koch.*
Thomsoni, *C. B. Clarke.*

Limnanthes alba, *Hartw.*
rosea, *Hartwg.*

Linaria albifrons, *Spreng.*
alpina, *Mill.*
anticaria, *Boiss. & Reut.*
bipartita, *Willd.*
Broussonetii, *Char.*
Cavanillesii, *Chav.*
dalmatica, *Mill.*
genistifolia, *Mill.*
heterophylla, *Desf.*
hirta, *Moench.*
maroccana, *Hook. f.*
minor, *Desf.*
multipunctata, *Hoffmgg. & Link.*
peloponnesiaca, *Boiss. & Heldr.*
purpurea, *L.*
reticulata, *Desf.*
sapphyrina, *Hoffmg. & Lk.*
saxatilis, *Hoffmgg. & Link.*
spartea, *Hoffmgg. & Link.*
striata, *DC.*
triornithophora, *Willd.*
triphylla, *Mill.*
tristis, *Mill.*
vulgaris, *Mill.*

Lindelophia spectabilis, *Lehm.*

Linum angustifolium, *Huds.*
monogynum, *Forst.*
nervosum, *Waldst. & Kit.*
perenne, *L.*
usitatissimum, *L.*

Loasa muralis, *Griseb.*
vulcanica, *André.*

Lobelia cardinalis, *L.*
Erinus, *L.*
tenuior, *R. Br.*
triquetra, *L.*

Lolium multiflorum, *Lam.*
perenne, *L.*

Lonas inodora, *Gaertn.*

Lopezia coronata, *Andr.*

Lotus edulis, *L.*
major, *Scop.*
ornithopodioides, *L.*
siliquosus, *L.*

Lotus, *cont.*
tenuis, *Waldst. & Kit.*
Tetragonolobus, *L.*

Lunaria annua, *L.*

Lupinus affinis, *Agardh.*
angustifolius, *L.*
arboreus, *Sims.*
Cosentini, *Guss.*
densiflorus, *Benth.*
elegans, *H. B. & K.*
leptophylla, *Benth.*
micranthus, *Dougl.*
mutabilis, *Sw.*
nanus, *Dougl.*
polyphyllus, *Lindl.*
pubescens, *Benth.*
pulchellus, *Sweet.*
tricolor, *Hort.*

Luzula maxima, *DC.*
nivea, *DC.*

Lychnis chalcedonica, *L.*
Coeli-rosea, *Backh.*
— var. elegans, *Hort.*
coronaria, *Desr.*
— var. oculata.
dioica, *L.*
Flos-cuculi, *L.*
fulgens, *Fisch.*
Githago, *Scop.*
grandiflora, *Jacq.*
haageana, *Lemaire.*
Lagascae, *Hook. f.*
pyrenaica, *Berger.*
Viscaria, *L.*

Lycopersicum esculentum, *Mill*

Lycopus europaeus, *L.*

Lycurus phleoides, *H. B. & K.*

Lysimachia atropurpurea, *L.*
barystachys, *Bunge.*
ciliata, *L.*

Lythrum Graefferi, *Tenore.*
hyssopifolia, *L.*
Salicaria, *L.*

Madia elegans, *D. Don.*
sativa, *Molina.*

Malcolmia africana, *R. Br.*
flexuosa, *Sibth.*
maritima, *R. Br.*

Malva Alcea, *L.*
crispa, *L.*
Duriaei, *Hort. Kew.*
moschata, *L.*
oxyloba, *Boiss.*
parviflora, *L.*
rotundifolia, *L.*
sylvestris, *L.*

Malvastrum limense, *Ball.*

Marrubium astracanicum, *Jacq.*
pannonicum, *Reichb.*

Matricaria glabra, *Ball.*
inodora, *L.*

Matthiola incana, *R. Br.*
sinuata, *R. Br.*
tricuspidata, *R. Br.*
tristis, *R. Br.*

Mazus rugosus, *Lour.*

Meconopsis cambrica, *Vig.*
Wallichi, *Hook.*

Medicago apiculata, *Willd.*
falcata, *L.*
lappacea, *Desr.*
littoralis, *Rhode.*
maculata, *Sibth.*
marina, *L.*
minima, *L.*
Murex, *Willd.*
orbicularis, *All.*
sativa, *L.*
scutellata, *All.*
tuberculata, *Willd.*

Melica altissima, *L.*
ciliata, *L.*
— var. penicillaris, (*Boiss. & Bal.*).
glauca, *F. Schultz* var. nebrodensis, (*Parl.*).
nutans, *L.*
uniflora, *Retz.*

Melilotus alba, *Desr.*
indica, *All.*
officinalis, *Lam.*

Mentha Pulegium, *L.*
sylvestris, *L.*
viridis, *L.*

Mercurialis annua, *L.*

Mesembryanthemum pomeridianum, *L.*
pyropeum, *Haw.*

Meum Athamanticum, *Jacq.*

Mimulus cardinalis, *Dougl.*
cupreus, *Regel.*
Lewisii, *Pursh.*
luteus, *L.*
moschatus, *Dougl.*

Mirabilis divaricata, *Lowe.*
Jalapa, *L.*
longiflora, *L.*
Modiola multifida, *Moench.*

Molinia caerulea, *Moench.*

Molopospermum cicutarium, *DC.*

Momordica Charantia, *L.*

Monolepis trifida, *Schrad.*

Moricandia arvensis, *DC.*

Moscharia pinnatifida. *Ruiz & Pav.*

Muehlenbergia glomerata, *Trin.*
mexicana, *Trin.*
sylvatica, *Torr. & Gray.*
Willdenovii, *Trin.*

Muscari Argaei, *Hort.*
armeniacum, *Baker.*
atlanticum, *Boiss. & Reut.*
comosum, *Mill.*
Heldreichii, *Boiss.*
latifolium, *Kirk.*
neglectum, *Guss.*
racemosum, *Mill.*
szovitsianum, *Baker.*

Myosotis arvensis, *Lam.*
dissitiflora, *Baker.*
palustris, *Lam.*
sylvatica, *Hoffm.*

Myosurus minimus, *L.*

Myriactis nepalensis, *Less.*

Myrrhis odorata. *Scop.*

Narcissus Pseudo-narcisssus, *L.*

Nasturtium montanum, *Wall.*

Nemesia floribunda, *Lehm.*
pubescens, *Benth.*
versicolor, *E. Mey.*

Nemophila insignis, *Dougl.*
maculata, *Benth.*
Menziesii, *Hook. & Arn.*
parviflora, *Dougl.*

Nepeta azurea, *R. Br.*
Cataria, *L.*
concolor, *Boiss. & Heldr.*
dirphya, *Heldr.*
macrantha, *Fisch.*
Mussini, *Spreng.*
Nepetella, *L.*
nuda, *L.*
spicata, *Benth.*
suavis, *Stapf.*

Nicandra physaloides, *Gaertn.*

Nicotiana acuminata, *Hook.*
alata, *Link & Otto.*
Bigelovii, *Wats.*
Langsdorffii, *Schrank.*
paniculata, *L.*
rustica, *L.*
sylvestris.
Tabacum, *L.*

Nigella damascena, *L.*
hispanica, *L.*
orientalis, *L.*
sativa, *L.*

Nolana prostrata, *L.*

Nonnea lutea, *Reichb.*

Nothoscordum fragrans, *Kunth.*

Oenanthe crocata, *L.*
pimpinelloides, *L.*

Oenothera amoena, *Lehm.*
berteriana, *Spach.*
biennis, *L.*
— var. grandiflora, *Torr. & Gray.*
densiflora, *Lindl.*
dentata, *Cav.*
fruticosa, *L.*
glauca, *Michx.*
humifusa, *Nutt.*
odorata, *Jacq.*

Oenothera, *cont.*
pumila, *L.*
riparia, *Nutt.*
rosea, *Ait.*
sinuata, *L.*
speciosa, *Nutt.*
tenella, *Cav.*
tetraptera, *Cav.*

Omphalodes linifolia, *Moench.*

Onobrychis sativa, *Lam.*

Ononis arvensis, *L.*
rotundifolia, *L.*
spinosa, *L.*

Onopordon Acanthium, *L.*
sibthorpianum, *Boiss.*

Opoponax Chironium, *Koch.*

Orchis foliosa, *Soland.*
incarnata, *L.*
latifolia, *L.*
maculata, *L.*

Origanum vulgare, *L.*

Ornithogalum arcuatum, *Stev.*
exscapum, *Tenore.*
fimbriatum, *Willd.*
lanceolatum, *Labill.*
narbonense, *L.*
nutans, *L.*

Ornithopus perpusillus, *L.*
sativus, *Brot.*

Orobanche elatior, *Sutt.*
Hederae, *Duby.*
minor, *Sutt.*
ramosa, *L.*

Oryzopsis multiflorum, *Benth. & Hook. f.*

Oxalis corniculata, *L.*

Oxybaphus albidus, *Sweet.*
nyctagineus, *Sweet.*

Oxytropis ochroleuca, *Bunge.*

Palaua dissecta, *Benth.*

Pallenis spinosa, *Cass.*

Panicum bulbosum, *H. B. & K.*
capillare, *L.*

Panicum, *cont.*
colonum, *L.*
Crus-galli, *L.*
Isachne, *Roth.*
miliaceum, *L.*
obtusum, *H. B. & K.*
sanguinale, *L.*
texanum, *Vasey.*
virgatum, *L.*

Papaver aculeatum, *Thunb.*
apulum, *Tenore.*
arenarium, *Bieb.*
Argemone, *L.*
dubium, *L.*
glaucum, *Boiss. & Hausskn.*
laevigatum, *Bieb.*
nudicaule, *L.*
orientale, *L.*
— var. bracteatum, (*Lindl.*).
pavoninum, *Mey.*
pilosum, *Sibth. & Sm.*
Rhoeas, *L.*
— var. latifolium, *Prain.*
rupifragum, *Boiss. & Reut.*
— var. atlanticum, *Ball.*
somniferum, *L.*

Paracaryum heliocarpum, *Kern.*

Parietaria officinalis, *L.*

Parnassia nubicola, *Wall.*
palustris, *L.*

Peganum Harmala, *L.*

Pennisetum macrourum, *Trin.*

Pentstemon barbatus, *Roth.*
campanulatus, *Willd.*
confertus, *Dougl.*
diffusus, *Dougl.*
glaucus, *Grah.* var. stenosepalus, *A. Gray.*
Hartwegii, *Benth.*
laevigatus, *Soland.* var. Digitalus, *A. Gray.*
ovatus, *Dougl.*
pubescens, *Soland.*

Petunia nyctaginiflora, *Juss.*

Peucedanum aegopodioides, *Vandas.*
coriaceum, *Reichb. f.*
gallicum, *Latour.*

Peucedanum, *cont.*
graveolens, *Benth.*
officinale, *L.*
sativum, *Benth. & Hook. f.*
Sowa, *Kurz.*
verticillare, *Spreng.*

Phacelia bipinnatifolia, *Michx.*
campanularia, *A. Gray.*
divaricata, *A. Gray.*
loasaefolia, *Torr.*
Parryi, *Torr.*
tanacetifolia, *Benth.*
viscida, *Torr.*
Whitlavia, *A. Gray.*

Phaenosperma globosa, *Munro.*

Phalaris canariensis, *L.*
intermedia, *Box.*
paradoxa, *L.*
tuberosa, *L.*

Phaseolus multiflorus, *Willd.*
ricciardianus, *Tenore.*
tuberosus, *Lour.*
vulgaris, *L.*

Phleum asperum, *Jacq.*
Boehmeri, *Wibel.*
pratense, *L.*

Phlomis agraria, *Bunge.*
setigera, *Falc.*
tuberosa, *L.*
umbrosa, *Turcz.*
viscosa, Poir.

Phygelius capensis, *E. Mey.*

Physalis Alkekengii, *L.*
Francheti, *Masi.*
peruviana, *L.*

Physochlaina orientalis, *G. Don.*

Physostegia virginiana, *Benth.*

Phyteuma canescens, *Waldst. & Kit.*
Halleri, *All.*
Michelii, *All.*
orbiculare, *L.*
Scheuchzeri, *All.*
spicatum, *L.*

Phytolacca acinosa, *Roxb.*

Phytolacca, *cont.*
decandra, *L.*
octandra, *L.*

Picridium tingitanum, *Desf.*

Picris echioides, *L.*
hieracioides, *L.*
pauciflora, *Willd.*

Pimpinella magna, *L.*

Pisum arvense, *L.*
elatius, *Bieb.*
sativum, *L.*

Plantago arenaria, *Waldst. & Kit.*
Candollei, *Rafin.*
Coronopus, *L.*
Cynops, *L.*
Lagopus, *L.*
maritima, *L.*
media, *L.*
Oreades, *Decne.*
ovata, *Forsk.*
patagonica, *Jacq.*

Platycodon grandiflorum, *A. DC.*

Platystemon californicus, *Benth.*

Pleurospermum angelicoides, *Benth.*

Plumbago micrantha, *Ledeb.*

Poa abyssinica, *Jacq.*
alpina, *L.*
arachnifera, *Torr.*
caesia, *Sm.*
caespitosa, *Forst.*
Chaixii, *Vill.*
chinensis, *L.*
compressa, *L.*
nemoralis, *L.*
nevadensis, *Vasey.*
palustris, *Roth.*
pratensis, *L.*
trivialis, *L.*
violacea, *Bell.*

Podolepis acuminata, *R. Br.*

Podophyllum Emodi, *Wall.*

Polemonium caeruleum, *L.*
flavum, *Greene.*
himalayanum, *Baker.*

Polemonium, *cont.*
mexicanum, *Cerv.*
pauciflorum, *S. Wats.*
reptans, *L.*

Polygonatum biflorum, *Ell.*
verticillatum, *All.*

Polygonum aviculare, *L.*
Bistorta, *L.*
cilinode, *Michx.*
compactum, *Hook. f.*
Convolvulus, *L.*
orientale, *L.*
Persicaria, *L.*
Weyrichii, *F. Schmidt.*

Polypogon maritimus, *Willd.*
monspeliensis, *Desf.*

Polypteris texana, *A. Gray.*

Portulaca grandiflora, *Hook.*
oleracea, *L.*

Potentilla alchemilloides, *Lapeyr.*
alpestris, *Hall. f.*
argentea, *L.*
— var. calabra, (*Tenore*).
arguta, *Pursh.*
argyrophylla, *Wall.*
calycina, *Boiss. & Bal.*
chinensis, *Ser.*
Comarum, *Nestl.*
collina, *Wibel.*
Detommasii, *Tenore.*
digitata × flabellata.
glandulosa, *Lindl.*
gracilis, *Dougl.*
heptaphylla, *Mill.*
hippiana, *Lehm.*
hirta, *L.*
kotschyana, *Fenzl.*
kurdica, *Boiss.*
montenegrina, *Pantoc.*
mooniana, *Wight.*
multifida, *L.*
nevadensis, *Boiss.*
opaca, *L.*
pennsylvanica, *L.* var. arachnoidea, *Lehm.*
pyrenaica, *Ramond.*
recta, *L.*
— var. laciniata.
— var. macrantha.
— var. palmata.

Potentilla, *cont.*
rivalis, *Nutt.* var. millegrana, *Wats.*
rupestris, *L.*
schrenkiana, *Regel.*
semi-laciniata, *Hort.*
sericea, *L.*
Sibbaldia, *Hall. f.*
tanacetifolia, *Willd.*
tridentata, *Soland.*
Visianii, *Panc.*
wrangeliana, *Fisch. & Mey.*

Poterium alpinum, *Hort.Kew.*
canadense, *A. Gray.*
officinale, *A. Gray.*
Sanguisorba, *L.*

Pratia angulata, *Hook. f.*

Preslia cervina, *Fresen.*

Primula cortusoides, *L.*
denticulata, *Sm.*
elatior, *Hill.*
japonica, *A. Gray.*
obconica, *Hance.*
officinalis, *Jacq.*
Poissoni, *Franch.*
rosea, *Royle.*
verticillata, *Forsk.*
vulgaris, *Huds.*
— var. coerulea.

Prunella grandiflora, *Jacq.*
— var. laciniata, *Hort.*
— var. rubra, *Hort.*
vulgaris, *L.*

Psoralea macrostachya, *DC.*
physodes, *Hook.*

Pulicaria dysenterica, *Gaertn.*

Pycnanthemum lanceolatum, *Pursh.*

Pyrrhopappus carolinianus, *DC.*

Queria hispanica, *L.*

Ramondia pyrenaica, *Rich.*

Ranunculus acris, *L.*
— var. Steveni.
arvensis, *L.*
brutius, *Tenore.*
caucasicus, *Bieb.*
chaerophyllus, *L.*

Ranunculus, *cont.*
Chius, *DC.*
Cymbalaria, *Pursh.*
falcatus, *L.*
Flammula, *L.*
gramineus, *L.*
lanuginosus, *L.*
Lingua, *L.*
muricatus, *L.*
ophioglossifolius, *Vill.*
parviflorus, *L.*
trilobus, *Desf.*

Raphanus maritimus, *Sm.*
sativus, *L.*

Rapistrum rugosum, *Berger.*

Relhania sessiliflora, *Thunbg.*

Reseda alba, *L.*
glauca, *L.*
lutea, *L.*
Luteola, *L.*
odorata, *L.*
virgata, *Boiss. & Reut.*

Rhagadiolus stellatus, *Gaertn.*

Rheum collinianum, *Baill.*
Emodi, *Wall.*
Franzenbachii, *Muent.*
macropterum, *Mart.*
officinale, *Baill.*
palmatum, *L.*
Rhaponticum, *L.*
rugosum, *Desf.*
undulatum, *L.*
webbianum, *Royle.*

Ricinus communis, *L.*

Roemeria hybrida, *DC.*

Rubia peregrina, *L.*
tinctorum, *L.*

Rudbeckia amplexicaulis, *Vahl.*
digitata, *Mill.*
hirta, *L.*
laciniata, *L.*
speciosa, *Wender.*

Rumex alpinus, *L.*
bucephalophorus, *L.*
conglomeratus, *Murr.*
crispus, *L.*
nepalensis, *Spreng.*

Rumex, *cont.*
obtusifolius, *L.*
occidentalis, *S. Wats.*
orientalis, *Bernh.*
Patientia, *L.*
pulcher, *L.*
salicifolius, *Weinm.*
sanguineus, *L.*
scutatus, *L.*
vesicarius, *L.*

Ruta graveolens, *L.*

Sagina glabra, *Fenzl.*
— var. pilifera, (*Fenzl*).

Salpiglossis linearis, *Hook.* var. grandiflora.
sinuata, *Ruiz & Pav.*

Salsola Kali, *L.* var Tragus, *Nym.*

Salvia argentea, *L.*
Beckeri, *Trautv.*
cadmica, *Boiss.*
Columbariae, *Benth.*
glutinosa, *L.*
Horminum, *L.*
— var. bracteis roseis.
— var. bracteis violaceis.
interrupta, *Schousb.*
nubicola, *Wall.*
nutans, *L.*
officinalis, *L.*
pratensis, *L.*
regeliana, *Trautv.*
schiedeana, *Stapf.*
Sclarea, *L.*
sylvestris, *L.*
tiliaefolia, *Vahl.*
umbratica, *Hance.*
Verbenaca, *L.*
verticillata, *L.*
virgata, *Ait.*
viscosa, *Jacq.*

Samolus Valerandi, *L.*

Sanvitalia procumbens, *Lam.*

Saponaria calabrica, *Guss.*
orientalis, *L.*
Vaccaria, *L.*

Saracha Jaltomata, *Schlecht.*

Satureja montana, *L.*

Saussurea albescens, *Hook. f. & Thoms.*
discolor, *DC.*
Maximowiczii, *Herd.*

Saxifragra Aizoon, *L.*
— var. Gaudinii, (*Bruegg.*).
— var. incrustata.
— var. rotata.
caesia, *L.*
caespitosa, *L.*
— var. hirta.
cartilaginea, *Willd.*
cochlearis, *Reichb.*
Cotyledon, *L.*
— var. pyramidalis, (*Lapeyr.*).
crustata, *Vest.*
decipiens, *Ehrh.* var. Steinmanni, (*Tausch*).
erosa, *Pursh.*
Geum, *L.*
granulata, *L.*
hirsuta, *L.*
Hostii, *Tausch.*
— var. altissima, (*Kern.*).
— var. macnabiana, *Hort.*
hypnoides, *L.*
lingulata, *Bell.*
— var. lantoscana, (*Boiss. & Reut.*).
mertensiana, *Bongard.*
mutata, *L.*
peltata, *Torr. & Gray.*
rotundifolia, *L.*
— var. hirsuta.
sarmentosa, *L.*
Sibthorpii, *Boiss.*
trifurcata, *Schrad.*
umbrosa, *L.*
— var. gracilis.

Scabiosa amoena, *Jacq.*
arvensis, *L.*
atropurpurea, *L.*
australis, *Wulf.*
banatica, *Waldst. & Kit.*
brachiata, *Sibth. & Sm.*
calocephala, *Boiss.*
caucasica, *Bieb.*
Columbaria, *L.*
graminifolia, *L.*
gramuntia, *L.*
integrifolia, *L.*
isetensis, *L.*

Scabiosa, *cont.*
lancifolia, *Lernat.*
macedonica, *Vis.*
micrantha, *Desf.*
palaestina, *L.*
Portae, *Huter.*
prolifera, *L.*
Pterocephala, *L.*
succisa, *L.*
triniæfolia, *Frivald.*
vestina, *Facc.*

Scandix Balansae, *Reut.*

Schizanthus pinnatus, *Ruiz & Pav.*

Schizopetalum Walkeri, *Sims.*

Scilla amoena, *L.*
bifolia, *L.*
festalis, *Salisb.*
hispanica, *Mill.*
peruviana, *L.*
sibirica, *Andrews.*
verna, *Huds.*

Scirpus Eriophorum, *Michx.*
Holoschoenus, *L.*
maritimus, *L.*
polyphyllus, *Vahl.*
triqueter, *L.*

Scleranthus annuus, *L.*

Sclerocarpus uniserialis, *Benth. & Hook. f.*

Scopolia lurida, *Dun.*

Scorpiurus vermiculata, *L.*

Scorzonera hirsuta, *L.*
villosa, *Scop.*

Scrophularia alata, *Gilib.*
alpestris, *J. Gay.*
aquatica, *L.*
chrysantha, *Jaub. & Spach.*
nodosa, *L.*
peregrina, *L.*
Scorodonia, *L.*
sylvatica, *Boiss. & Heldr.*
vernalis, *L.*

Scutellaria albida, *L.*
alpina, *L.*

Scutellaria, *cont.*
altissima, *L.*
baicalensis, *Georgi.*
galericulata, *L.*

Securigera Coronilla, *L.*

Sedum Aizoon, *L.*
album, *L.*
Anacampseros, *L.*
caeruleum, *Vahl.*
hispanicum, *L.*
hybridum, *L.*
maximum, *Sut.*
— var. atropurpureum.
roseum, *Scop.*
Telephium, *L.*
villosum, *L.*
wallichianum, *Hook. f. & Thoms.*

Selinum Gmelini, *Bray.*
tenuifolium, *Wall.*

Sempervivum arvernense, *Lecoq & Lamotte.*
Boissieri, *Hort.*
boutignyanum, *Billot & Gren.*
flagelliforme, *Fisch.*
mettenianum, *Schnittsp.*
montanum, *L.*
obscurum, *Hort.*
Pilosella, *Hort.*
Pomellii, *Lamotte.*
Royeni, *Hort.*
speciosum, *Lamotte.*
tectorum, *L.*
— var. rusticanum, *Hort.*
Verloti, *Lamotte.*

Senecio adonidifolius, *Loisel.*
Cineraria, *DC.*
diversifolius, *Wall.*
Doria, *L.*
elegans, *L.*
Fetisowii, *Regel.*
Hodgsoni, *Hort. Kew.*
japonicus, *Sch. Bip.*
Kaempferi, *DC.*
macrophyllus, *Bieb.*
nemorensis, *L.*
squalidus, *L.*
suaveolens, *Ell.*
viscosus, *L.*

Serratula coronata, L.
Gmelinii, *Ledeb.*
heterophylla, *Desf.*
quinquefolia, *Bieb.*
tinctoria, *L.*

Sesamum indicum, *L.*

Seseli annuum, *L.*
elatum, *L.*
osseum, *Crantz.*

Setaria glauca, *Beauv.*
italica, *Beauv.*
macrochaeta, *Spreng.*
verticillata, *Beauv.*
viridis, *Beauv.*

Sida Napaea, *Cav.*

Sidalcea candida, *A. Gray.*

Sideritis scordioides, *L.*

Siegesbeckia orientalis, *L.*

Silene alpestris, *Jacq.*
Armeria, *L.*
chloraefolia, *Sm.* var. swertifolia.
chromodonta, *Boiss. & Reut.*
ciliata, *Pourr.*
clandestina, *Jacq.*
colorata, *Poir.*
conoidea, *L.*
cretica, *L.*
Cucubalus, *Wibel.*
echinata, *Otth.*
Fabaria, *Sibth. & Sm.*
fimbriata, *Sims.*
Fortunei, *Vis.*
fuscata, *Link.*
gallica, *L.*
glauca, *Pourr.*
italica, *Pers.*
juvenalis, *Delile.*
laeta, *A. Br.*
linicola, *C. C. Gmel.*
longicilia, *Otth.*
longiflora, *Ehrh.*
monachorum, *Vis.*
Muscipula, *L.*
noctiflora, *L.*
nutans, *L.*
obtusifolia, *Willd.*
pendula, *L.*

Silene, *cont.*
quadrifida, *L.*
rubella, *L.*
Sartori, *Boiss.*
Saxifraga, *L.*
Schafta, *Gmel.*
sedoides, *Jacq.*
squamigera, *Boiss.*
stylosa, *Bunge.*
Tanakae, *Maxim.*
tatarica, *Pers.*
tenuis, *Willd.*
undulata, *Ait.*
vallesia, *L.*
verecunda, S. *Wats.*
vesiculifera, *J. Gay.*

Siler trilobum, *Scop.*

Silphium perfoliatum, *L.*
scaberrimum, *Ell.*
trifoliatum, *L.*
— var. ternatum, *Retz.*

Silybum eburneum, *Coss. & Dur.*
Marianum, *Gaertn.*

Sisymbrium assoanum, *Losc. & Pard.*
austriacum, *Jacq.*
multifidum, *Willd.*
polyceratium, *L.*
Sophia, *L.*
strictissimum, *L.*

Sisyrinchium angustifolium, *Mill.*
striatum, *Sm.*

Sium latifolium, *L.*
nipponicum, *Maxim.*

Smilacina racemosa, *Desf.*
stellata, *Desf.*

Smyrnium Olusatrum, *L.*
perfoliatum, *L.*
rotundifolium, *Mill.*

Solanum etuberosum, *Lindl.*
guineense, *Lam.*
nigrum, *L.*
villosum, *Willd.*

Solenanthes lanatus, *A.DC.*

Solidago arguta, *Ait.*
canadensis, *L.*
Drummondi, *Torr. & Gray.*
elliptica, *Ait.*
glomerata, *Michx.*
lithospermifolia, *Willd.*
Virgaurea, *L.*

Sonchus oleraceus, *L.*
palustris, *L.*

Sorghum vulgare, *Pers.*

Sparganium simplex, *Huds.*

Spartina polystachya, *Willd.*

Specularia falcata, *A.DC.*
hybrida, *DC. f.*
pentagonia, *A.DC.*
perfoliata, *A.DC.*
Speculum, *A.DC.*

Spergula arvensis, *L.*

Sphaeralcea rivularis, *Torr.*

Spinacea oleracea, *L.*

Spiraea Aruncus, *L.*
Filipendula, *L.*
Ulmaria, *L.*

Stachys alpina, *L.*
— var. intermedia.
annua, *L.*
arvensis, *L.*
Betonica, *Benth.*
grandiflora, *Benth.*
setifera, *C. A. Mey.*
sylvatica, *L.*

Statice bellidifolia, *Gouan.*
Bonduelli, *Lestib.*
echioides, *L.*
eximia, *Schrenk.*
Gmelinii, *Willd.*
gougetiana, *Girard.*
leptostachya, *Boiss.*
Limonium, *L.*
sinensis, *Girard.*
sinuata, *L.*
subpuberula, *Hort.*
Suworowi, *Regel.*
Thouini, *Viv.*

Stevia serrata, *Cav.*

Stipa Aristella, *L.*
Calamagrostis, *Wahlenb.*
capillata, *L.*
papposa, *Nees.*
pennata, *L.*
sibirica, *Lam.*
spartea, *Trin.*
viridula, *Trin.*

Swertia cordata, *Wall.*
perennis, *L.*

Symphyandra Hofmanni, *Pant.*
pendula, *A.DC.*
Wanneri, *Heuff.*

Symphytum peregrinum, *Ledeb.*

Synthyris reniformis, *Benth.*

Tagetes erecta, *L.*
patula, *L.*
pusilla, *H. B. & K.*

Tamus communis, *L.*

Tanacetum vulgare, *L.*

Taraxacum gymnanthum, *DC.*

Teesdalia nudicaulis, *Br.*
regularis, *Sm.*

Telephium Imperati, *L.*

Tellima grandiflora, *R. Br.*

Tetragonia crystallina, *L'Herit.*
expansa, *Murr.*

Teucrium Arduini, *L.*
aureum, *Schreb.*
Botrys, L.
canadense, *L.*
Chamaedrys, *L.*
flavum, *L.*
Marum, *L.*
montanum, *L.*
multiflorum, *L.*
Scorodonia, *L.*

Thalictrum angustifolium, *L.*
corynellum, *DC.*
glaucum, *Desf.*
minus, *L.*
—var. collinum, (*Wallr.*)
—var. elatum, (*Jacq.*).
—var. flexuosum, (*Bernh.*).
—var. pubescens, (*Schleich.*).

Thalictrum, *cont.*
— var. purpurascens, (*Georgi*).
odoratum, *Gren. & Godr.*
squarrosum, *Stephan.*

Thaspium trifoliatum, *A. Gray.*

Thelesperma filifolium, *A. Gray.*

Thermopsis caroliniana, *M. A. Curtis.*

Thladiantha dubia, *Bunge.*

Thlaspi arvense, *L.*
kotschyanum, *Boiss.*
latifolium, *Bieb.*
perfoliatum, *L.*

Tinantia fugax, *Scheidw.*

Tolmiea Menziesii, *Torr. & Gray.*

Tolpis barbata, *Gaertn.*

Trachelium caeruleum, *L.*

Trachymene pilosa, *Sm.*

Tragopogon major, *L.*
pratensis, *L.*

Tragus racemosus, *Hall.*

Tricholepis furcata, *DC.*

Tridax trilobata, *Hemsl.*

Trifolium agrarium, *L.*
angustifolium, *L.*
armenium, *Willd.*
Balansae, *Boiss.*
clypeatum, *L.*
diffusum, *Ehrh.*
fragiferum, *L.*
glomeratum, *L.*
hybridum, *L.*
incarnatum, *L.*
lappaceum, *L.*
leucanthum, *Bieb.*
maritimum, *Huds.*
medium, *L.*
multistriatum, *Koch.*
pannonicum, *L.*
Perreymondi, *Gren. & Godr.*
pratense, *L.*
procumbens, *L.*

Trifolium, *cont.*
purpureum, *Loisel.*
roscidum, *Greene.*
repens, *L.*
resupinatum, *L.*
rubens, *L.*
scabrum, *L.*
spumosum, *L.*
squarrosum, *L.*
stellatum, *L.*
striatum, *L.*
tridentatum, *Lindl.*

Triglochin maritimum, *L.*
palustre, *L.*

Trigonella corniculata, *L.*
caerulea, *Ser.*
cretica, *Boiss.*
Foenum-graecum, *L.*
ovalis, *Boiss.*
polycerata, *L.*

Trillium grandiflorum, *Salisb.*

Tripteris cheiranthifolia, *Schultz.*

Trisetum flavescens, *Beauv.*

Triticum Aegilops, *Beauv.*
monococcum, *L.*
spelta, *L.*
villosum, *Beauv.*
violaceum, *Hornem.*
vulgare, *Vill.*

Tritonia Pottsii, *Benth.*

Tropaeolum aduncum, *Sm.*
majus, *L.*
minus, *L.*

Troximon chilensis, *Benth. & Hook. f.*
grandiflorum, *A. Gray.*
laciniatum, *A. Gray.*

Tunica prolifera, *Scop.*
Saxifraga, *Scop.*

Typha angustifolia, *L.*
latifolia, *L.*
stenophylla, *Fisch. & Mey.*

Uniola latifolia, *Michx.*

Urospermum picroides, *Desf.*

Ursinia pulchra, *N. E. Br.*

Urtica membranacea, *Poir.*
pilulifera, *L.*
— var. balearica, (*L.*).
—var. Dodarti, (*L.*)
thunbergiana, *Sieb. & Zucc.*

Valeriana officinalis, *L.*
— var. exaltata, (*Mikan*).
— var. sambucifolia, (*Mikan*).
Phu, *L.*

Valerianella carinata, *Loisel.*
coronata, *DC.*
dentata, *Poll.*
echinata, *DC.*
eriocarpa, *Desv.*
olitoria, *Poll.*
vesicaria, *Moench.*

Vella annua, *L.*

Venidium perfoliatum, *Less.*

Veratrum nigrum, *L.*

Verbascum Chaixii, *Vill.*
Lychnitis, *L.*
nigrum, *L.*
orientale, *Bieb.*
phlomoides, *L.*
pulverulentum, *Vill.*
sinuatum, *L.*
Thapsus, *L.*

Verbena angustifolia, *Michx.*
Aubletia, *L.*
biserrata, *H. B.*
bonariensis, *L.*
caroliniana, *Michx.*
officinalis, *L.*
urticifolia, *L.*

Verbesina helianthoides, *Michx.*

Veronica aphylla, *L.*
austriaca, *L.*
Bidwillii, *Hook. f.*
exaltata, *Maud.*
incana, *L.*
longifolia, *L.*
officinalis, *L.*
persica, *Poir.*
repens, *DC.*

Veronica, *cont.*
saxatilis, *Scop.*
spicata, *L.*
virginica, *L.*
— var. japonica, (*Steud.*).

Vesicaria grandiflora, *Hook.*

Vicia amphicarpa, *Dorth.*
argentea, *Lapeyr.*
atropurpurea, *Desf.*
bithynica, *L.*
calcarata, *Desf.*
Cracca, *L.*
disperma, *DC.*
Faba, *L.*
— var. equina, (*Steud.*).
fulgens, *Batand.*
gigantea, *Hook.*
lutea, *L.*
melanops, *Sibth. & Sm.*
narbonensis, *L.*
pratensis, *Mert.*
pyrenaica, *Pourr.*
sativa, *L.*
sepium, *L.*
sicula, *Guss.*
sylvatica, *L.*
unijuga, *A. Braun.*
villosa, *Roth.*

Vincetoxicum fuscatum, *Reichb. f.*
nigrum, *Moench.*
officinale, *Moench.*

Viola cornuta, *L.*
elatior, *Fries.*

Viola, *cont.*
hirta, *L.*
Jooi, *Janka.*
lutea, *Huds.*
odorata, *L.*
palustris, *L.*
pratensis, *Mert. & Koch.*
pubescens, *Ait.*
rotundifolia, *Michx.*
striata, *Ait.*
sylvestris, *Lam.*
syrtica, *Sünd.*
tricolor, *L.*

Volutarella Lippii, *Cass.*
muricata, *Benth. & Hook. f.*

Wahlenbergia dalmatica, *A.DC.*
lobelioides, *Link.*
serpyllifolia, *Hort. Kew.*
tenuifolia, *A.DC.*

Waitzia aurea, *Steetz.*

Xanthisma texanum, *DC.*

Xanthium spinosum, *L.*
strumarium, *L.*

Xanthocephalum gymnospermoides, *Benth. & Hk. f.*

Xeranthemum annuum, *L.*

Zaluzianskya capensis, *Walp.*

Zauschneria californica, *Presl.*

Ziziphora tenuior, *L.*

Zygadenus elegans, *Pursh.*

TREES AND SHRUBS.

Acanthopanax sessiliflorum, *Seem.*

Acer campestre, *L.*
— var. aetnense.
— var. collinum, *Wallr.*
circinatum, *Pursh.*
coriaceum, *Tausch.*
hyrcanum, *Fisch. & Mey.*
insigne, *Boiss. & Buhse.*
japonicum, *Thunb.*
Lobelii, *Tenore.*

Acer, *cont.*
macrophyllum, *Pursh.*
monspessulanum, *L.*
opulifolium, *Vill.*
— var. neapolitanum.
pennsylvanicum, *L.*
platanoides, *L.*
Pseudo-Platanus, *L.*
— var. purpureum.
tataricum, *L.*

Ailantus glandulosa, *Desf.*

Alnus cordifolia, *Tenore.*
glutinosa, *Gaertn.*
incana, *Willd.*
japonica, *Sieb. & Zucc.*
maritima, *Muehlenb.*
nitida, *Endl.*
oregona, *Nutt.*
orientalis, *Decne.*
rhombifolia, *Nutt.*
serrulata, *Willd.*
subcordata, *C. A. Mey.*
viridis, *DC.*

Amelanchier alnifolia, *Nutt.*
canadensis, *Torr. & Gray.*
vulgaris, *Moench.*

Amorpha canescens, *Nutt.*
fruticosa, *L.*

Andromeda polifolia, *L.*

Arbutus Andrachne, *L.*
Menziesii, *Pursh.*
Unedo, *L.*

Arctostaphylos Uva-Ursi, *Spreng.*
— var. californica.

Aucuba japonica, *Thunb.*

Berberis aetnensis, *Presl.*
angulosa, *Wall.*
Aquifolium, *Pursh.*
— var. fascicularis, *Nichols.*
— var. murrayana, *Hort.*
aristata, *DC.*
— var. floribunda.
— var. umbellata.
buxifolia, *Lam.*
canadensis, *Pursh.*
concinna, *Hook. f.*
Darwinii, *Hook.*
Lycium, *Royle.*
repens, *Lindl.*
Sieboldii, *Miq.*
sinensis, *Desf.*
— var. spathulata.
Thunbergi, *DC.*
virescens, *Hook. f.*
vulgaris, *L.*
— var. foliis purpureis.
wallichiana, *DC.*

Betula alba, *L.*
— var. pubescens, *Loud.*

Betula, *cont.*
corylifolia, *Regel & Maxim.*
davurica, *Pall.*
Ermani, *Cham.*
fruticosa, *Pall.*
— var. Gmelini, *Regel.*
humilis, *Schrenk.*
lenta, *L.*
lutea, *Michx.*
nana, *L.*
papyrifera, *Marsh.*
populifolia, *Marsh.*
pumila, *L.* var. fastigiata.
ulmifolia, *Sieb. & Zucc.*

Bruckenthalia spiculifolia, *Reichb.*

Buddleia intermedia, *Carr.*
japonica, *Hemsl.*
variabilis, *Hemsl.*

Buxus sempervirens, *L.*
— var. latifolia.
— var. prostrata.

Calluna vulgaris, *Salisb.*

Calophaca wolgarica, *Fisch.*

Calycanthus occidentalis, *Hook. & Arn.*

Caragana arborescens, *Lam.*
— var. Redowskii.
aurantiaca, *Koehne.*
brevispina, *Royle.*
frutescens, *DC.*
microphylla, *Lam.*
pygmaea, *DC.*

Carmichaelia australis, *R. Br.*

Carpinus Betulus, *L.*
— var. incisa.
caroliniana, *Walt.*
orientalis, *Mill.*

Cassandra calyculata, *D. Don.*

Cassinia fulvida, *Hook. f.*
leptophylla, *Hort.*

Catalpa cordifolia, *Jaume.*

Ceanothus americanus, *L.*
Arnoldi, *Hort.*
azureus, *Desf.*
grandiflorus, *Hort.*

Ceanothus, *cont.*
integerrimus, *Hk. & Arn.*
papillosus, *Torr. & Gray.*

Celastrus articulatus, *Thunb.*

Celtis australis, *L.*
occidentalis, *L.*
Tournefortii, *Lam.*

Cistus hirsutus, *Lam.*
laurifolius, *L.*
salvifolius, *L.*
vaginatus, *Ait.*

Cladrastis amurensis, *Benth.*

Clematis aethusifolia, *Turcz.*
alpina, *Mill.*
campaniflora, *Brot.*
crispa, *L.*
Flammula, *L.*
fusca, *Turcz.*
lanuginosa, *Lindl.*
orientalis, *L.*
Pitcheri, *Torr. & Gray.* var. lasiostylis.
songorica, *Bunge.*
Vitalba, *L.*
Viticella, *L.* var. alba.
— var. rubra.

Clethra acuminata, *Michx.*
alnifolia, *L.*
— var. Michauxii.

Colutea arborescens, *L.*
cruenta, *Ait.*
melanocalyx, *Boiss.*

Conyza ivaefolia, *Less.*

Coriaria japonica, *A. Gray.*

Cornus alba, *L.*
alternifolia, *L. f.*
Amomum, *Mill.*
Baileyi, *Coult. & Evans.*
glabrata, *Benth.*
Mas, *L.*
pubescens, *Nutt.*
sanguinea, *L.*
stolonifera, *Michx.*

Coronilla Emerus, *L.*

Corylus rostrata, *Ait.*

Cotoneaster affinis, *Lindl.*
bacillaris, *Wall.*
— var. floribunda, *Hort.*
buxifolia, *Wall.*
frigida, *Wall.*
horizontalis, *Decne.*
integerrima, *Medic.*
laxiflora, *Jacq.*
lucida, *Schlecht.*
microphylla, *Wall.*
Nummularia, *Fisch. & Mey.*
pannosa, *Franch.*
rotundifolia, *Wall.*
Simonsii, *Baker.*
thymifolia, *Baker.*

Crataegus Azarolus, *L.*
Carrièrei, *Vauvel.*
chlorosarca, *Maxim.*
coccinea, *L.*
—var. macracantha, *Dudley.*
cordata, *Ait.*
Crus-Galli, *L.*
— var. splendens, *Lodd.*
Douglasii, *Lindl.*
flava, *Ait.*
heterophylla, *Fluegg.*
hiemalis, *Lange.*
melanocarpa, *Bieb.*
mollis, *Scheele.*
monogyna, *Jacq.*
nigra, *Waldst. & Kit.*
orientalis, *Pall.*
— var. sanguinea.
oxyacanthoides, *Thuill.*
— var. fructu luteo.
pentagyna, *Kit.*
pinnatifida, *Bunge.*
punctata, *Jacq.*
Pyracantha, *Pers.*
sanguinea, *Pall.*
sinaica, *Boiss.*
tanacetifolia, *Pers.*
tomentosa, *L.*
uniflora, *Muench.*

Cryptomeria japonica, *D. Don*

Cupressus lawsoniana, *Murr.*
nootkatensis, *Lamb.*
obtusa, *C. Koch.*
pisifera, *C. Koch.*
thyoides, *L.*
torulosa, *D. Don.*
— var. corneyana.

Cytisus albus, *L.*
biflorus, *L'Herit.*
capitatus, *Jacq.*
frivaldskyanus, *Degen.*
nigricans, *L.*
praecox, *Hort.*
purgans, *Boiss.*
purpureus, *Scop.*
scoparius, *L.*
— var. andréanus.
— var. pendulus.
— var. sulphureus.
sessilifolius, *L.*

Daboëcia polifolia, *D. Don.*

Desmodium viridiflorum, *Beck.*

Deutzia crenata, *Sieb. & Zucc.*

Diervilla hortensis, *S. & Z.*
sessilifolia, *Buckl.*
— var. splendens.

Dorycnium suffruticosum, *Vill.*

Eccremocarpus scaber, *Ruiz & Pav.*

Elaeagnus angustifolia, *L.*
multiflora, *Thunb.*
umbellata, *Thunb.*

Erica cinerea, *L.*
mediterranea, *L.*
multiflora, *L.*
scoparia, *L.*
stricta, *Donn.*
Tetralix, *L.*
vagans, *L.*

Escallonia exoniensis, *Hort.*
punctata, *DC.*
rubra, *Pers.*

Euonymus europaeus, *L.*
— var. purpureus.
latifolius, *Scop.*
nanus, *Bieb.*
obovatus, *Nutt.*

Exochorda Alberti, *Regel.*

Fraxinus nigra, *Marsh.*
Ornus, *L.*

Gaultheria procumbens, *L.*
pyrolaefolia, *Hook. f.*
Shallon, *Pursh.*

Gaylussacia resinosa, *Torr. & Gray.*

Genista aethnensis, *DC.*
anglica, *L.*
cinerea, *DC.*
germanica, *L.*
hispanica, *L.*
pilosa, *L.*
sagittalis, *L.*
tinctoria, *L.* var. elatior.
virgata, *DC.*

Halesia corymbosa, *Nichols.*
tetraptera, *L.*

Hedera Helix, *L.*

Hedysarum multijuga, *Maxim.*

Helianthemum canum, *Dunal.*
formosum, *Dunal.*
halimifolium, *Willk.*
polifolium, *Pers.*
vulgare, *Gaertn.*
— var. mutabile.
— var. rhodanthum.

Hippophaë rhamnoides, *L.*

Hydrangea arborescens, *L.*
Hortensia, *DC.* var. acuminata, *A. Gray.*
paniculata, *Sieb. & Zucc.*
petiolaris, *Sieb. & Zucc.*
pubescens, *Decne.*
radiata, *Walt.*

Hymenanthera crassifolia, *Hook. f.*

Hypericum Androsaemum, *L.*
Ascyron, *L.*
aureum, *Bartr.*
calycinum, *L.*
corymbosum, *Muhl.*
densiflorum, *Pursh.*
elatum, *Ait.*
erectum, *Thunb.*
hircinum, *L.*
— var. minor.
hookerianum, *Wight & Arn.*
inodorum, *Jacq.*
kalmianum, *L.*
moserianum, *André.*
patulum, *Thunb.*
prolificum, *L.*

Ilex Aquifolium, *L.*
crenata, *Thunb.*
decidua, *Walt.*
glabra, *A. Gray.*
opaca, *Ait.*
verticillata, *A. Gray.*
— var. fructu luteo.

Indigofera gerardiana, *Wall.*
hebepetala, *Benth.*

Jasminum fruticans, *L.*
humile, *L.*

Juniperus chinensis, *L.*
communis, *L.*
excelsa, *Bieb.*
Sabina, *L.*
sphaerica, *Lindl.*

Kalmia angustifolia, *L.*
— var. nana.
— var. ovata.
glauca, *Ait.*
latifolia, *L.*

Laburnum alpinum, *J. S. Presl.*
— var. biferum, *Hort.*
— vulgare, *J. S. Presl.*

Larix davurica, *Trautv.*
europaea, *DC.*
leptolepis, *Endl.*
— var. murrayana.

Ledum latifolium, *Ait.*
palustre, *L.*

Lespedeza bicolor, *Turcz.*
Stuvei, *Nutt.*

Leucothoe Catesbaei, *A. Gray.*
Davisiae, *Torr.*
racemosa, *A. Gray.*

Leycesteria formosa, *Wall.*

Ligustrum Ibota, *Sieb.*
—var. regelianum.
sinense, *Lour.*
vulgare, *L.*

Lindera Benzoin, *Blume.*

Liriodendron tulipifera, *L.*

Lonicera alpigena, *L.*
angustifolia, *Wall.*
Caprifolium, *L.*

Lonicera, *cont.*
chrysantha, *Turcz.*
depressa, *Royle.*
glauca, *Hill.*
iberica, *Bieb.*
japonica, *Thunb.*
Maximowiczii, *Maxim.*
Morrowii, *A. Gray.*
nigra, *L.*
obovata, *Royle.*
orientalis, *Lam.*
Periclymenum, *L.*
— var. serotina.
segreziensis, *Lavallée.*
Sullivantii, *A. Gray.*
syringantha, *Maxim.*
tatarica, *L.*
Xylosteum, *L.*

Lupinus arboreus, *L.*

Lyonia paniculata, *Nutt.*

Magnolia tripetala, *L.*

Menispermum canadense, *L.*

Menziesia globularis, *Salisb.*

Microglossa albescens, *C. B. Clarke.*

Morus nigra, *L.*

Myrica carolinensis, *Mill.*
cerifera, *L.*
Gale, *L.*

Myricaria germanica, *Desv.*

Neillia amurensis, *Benth. & Hook.*
opulifolia, *Benth. & Hook.*
Torreyi, *Wats.*

Olearia Haastii, *Hook. f.*
macrodonta, *Baker.*

Ononis aragonensis, *Asso.*
rotundifolia, *L.*

Oxydendron arboreum, *DC.*

Pernettya mucronata, *Gaudich.*

Petteria ramentacea, *Presl.*

Philadelphus acuminatus, *Lange.*
coronarius, *L.*

Philadelphus, *cont.*
— var. tomentosus, *Hook. f. & Thoms.*
gordonianus, *Lindl.*
grandiflorus, *Willd.*
hirsutus, *Nutt.*
Keteleeri, *Hort.*
Lemoinei, *Hort.*
Lewisii, *Pursh.*
Satsumi, *Siebold.*

Photinia variabilis, *Hemsl.*

Picea Glehni, *F. Schmidt.*
sitchensis, *Trautv. & Mey.*

Pieris japonica, *D. Don.*
mariana, *Benth. & Hook.*

Pinus Cembra, *L.*
monticola, *Dougl.*
Peuke, *Griseb.*
ponderosa, *Dougl.*
Thunbergii, *Parl.*

Piptanthus nepalensis, *Sweet.*

Platanus acerifolia, *Willd.*
occidentalis, *L.*
orientalis, *L.*

Populus deltoidea, *Marsh.*
nigra, *L.*

Potentilla fruticosa, *L.*
salesoviana, *Steph.*

Prunus acida, *Borkh.* var. semperflorens.
americana, *Marsh.*
Amygdalus, *Stokes.*
Brigantiaca, *Chaix.*
cerasifera, *Ehrh.*
demissa, *Walp.*
Laurocerasus, *L.* var. colchica.
lusitanica, *L. f.*
Mahaleb, *L.*
maritima, *Wangenh.*
nigra, *Ait.*
serotina, *Ehrh.*

Ptelea trifoliata, *L.*

Pyrus alpina, *Willd.*
americana, *DC.*
arbutifolia, *L.*

Pyrus, *cont.*
Aria, *L.*
— var. graeca, *Boiss.*
Aucuparia, *Gaertn.*
baccata, *L.*
betulaefolia, *Bunge.*
canescens, *Spach.*
communis, *L.*
Cydonia, *L.*
decaisneana, *Nichols.*
floribunda, *Nichols.*
germanica, *Hook. f.*
intermedia, *Ehrh.*
japonica, *Thunb.*
lanata, *D. Don.*
lanuginosa, *DC.*
lobata, *Nichols.*
longipes, *Coss. & Durieu.*
Malus, *L.*
Maulei, *Mast.*
Michauxi, *Bosc.*
nigra, *Sargent.*
nivalis, *Jacq.*
pinnatifida, *Ehrh.*
prunifolia, *Willd.*
Ringo, *Maxim.*
rotundifolia, *Bechst.*
sikkimensis, *Hook. f.*
sinaica, *Thouin.*
Sorbus, *Gaertn.*
spectabilis, *Ait.*
spuria, *DC.*
Toringo, *Sieb.*

Rhamnus Alaternus, *L.*
— var. angustifolius.
catharticus, *L.*
crenata, *Sieb. & Zucc.*
Frangula, *L.*
libanoticus, *Boiss.*
purshianus, *DC.*

Rhododendron cinnabarinum, *Hook. f.*
ferrugineum, *L.*
flavum, *G. Don.*
myrtifolium, *Lodd.*
ponticum, *L.*
— var. cheiranthifolium.
— — lancifolium.
punctatum, *Andr.*

Rhodotypus kerrioides, *Sieb. & Zucc.*

Rhus Cotinus, *L.*

Rhus, *cont.*
glabra, *L.*
Toxicodendron, *L.*
typhina, *L.*

Ribes alpinum, *L.*
— var. pumilum, *Hort.*
aureum, *Pursh.*
— var. aurantiacum minus, *Hort.*
— var. tenuiflorum, *Torr.*
cereum, *Dougl.*
divaricatum, *Dougl.*
fasciculatum, *Sieb. & Zucc.*
Grossularia, *L.*
multiflorum, *Waldst. & Kit.*
petraeum, *Wulf.*
robustum, *Hort.*
rubrum, *L.*
— var. Schlechtendalii.
sanguineum, *Pursh.*
— var. atrosanguineum, *Hort.*
— var. carneum.

Robinia Pseudacacia, *L.*

Rosa acicularis, *Lindl.*
agrestis, *Savi.*
alba, *L.*
alpina, *L.*
— var. pyrenaica, *Gouan.*
arkansana, *Porter.*
beggeriana, *Schrenk.*
— var. Schrenki.
blanda, *Ait.*
canina, *L.*
carolina, *L.*
— var. nuttalliana.
cinnamomea, *L.*
— var. glandulifolia.
damascena, *Mill.*
Fendleri, *Crépin.*
ferox, *Bieb.*
ferruginea, *Vill.*
foliolosa, *Nutt.*
gallica, *L.*
hibernica, *Sm.*
hispida, *Sims.*
humilis, *Marsh.*
— var. triloba.
involuta, *Sm.* var. Wilsoni, *Baker.*
Jundzilli, *Besser.*

Rosa, *cont.*
lucida, *Ehrh.*
lutea, *Mill.*
macrophylla, *Lindl.*
— var. parviflora.
Malyi, *Kerner.*
micrantha, *Sm.*
microphylla, *Roxb.*
mollis, *Sm.*
moschata, *Mill.*
multiflora, *Thunb.*
nipponensis, *Crép.*
nitida, *Willd.*
nutkana, *Presl.*
pisocarpa, *A. Gray.*
pomifera, *Herrm.*
repens, *Scop.*
rubella, *Sm.*
rubiginosa, *L.*
rugosa, *Sieb. & Zucc.*
— var. calocarpa.
sericea, *Lindl.*
spinosissima, *L.*
— var. altaica.
stylosa, *Desv.*
tomentosa, *Sm.*
webbiana, *Wall.*
wichuraiana, *Crépin.*

Rubus affinis, *Weihe & Nees.*
balfourianus, *Blox.*
Bellardii, *Weihe.*
biflorus, *Buchan.*
caesius, *L.*
Colemani, *Blox.*
corylifolius, *Sm.*
crataegifolius, *Bunge.*
deliciosus, *James.*
dumetorum, *W. & N.*
echinatus, *Lindl.*
exsecatus, *Muell.*
foliolosus, *D. Don.*
fuscus, *Weihe & Nees.*
glandulosus, *Bell.*
Guentheri, *Weihe & Nees.*
hystrix, *Weihe & Nees.*
Koehleri, *W. & N.*
laciniatus, *Willd.*
lasiostylis, *Focke.*
leucodermis, *Dougl.*
leucostachys, *Sm.*
lindleyanus, *Lees.*
longithyrsiger, *Lees.*
macrophyllus, *W. & N.*

Rubus, *cont.*
melanolasius, *Focke.*
micans, *Gren. & Godr.*
mucronatus, *Blox.*
mutabilis, *Genev.*
neglectus, *Peck.*
niveus, *Wall.*
nutkanus, *Moç.*
occidentalis, *L.*
odoratus, *L.*
parvifolius, *L.*
phoenicolasius, *Maxim.*
pubescens, *Auct. Angl.*
Purchasi, *Blox.*
Radula, *Weihe.*
ramosus, *Blox.*
rhamnifolius, *W. & N.*
scaber, *Weihe & Nees.*
spectabilis, *Pursh.*
Sprengelii, *Weihe & Nees.*
suberectus, *Anders.*
thyrsiflorus, *Weihe & Nees.*
thyrsoideus, *Wimm.*
ulmifolius, *Schott.*
villicaulis, *W. & N.*
villosus, *Ait.*
xanthocarpus, *Franch.*

Ruta graveolens, *L.*

Sambucus canadensis, *L.*
glauca, *Nutt.*
melanocarpa, *A. Gray.*
nigra, *L.*
racemosa, *L.*
— var. serratifolia.

Smilax rotundifolia, *L.*

Spartium junceum, *L.*

Spiraea betulifolia, *Pall.*
bracteata, *Zabel.*
canescens, *D. Don.*
chamœdrifolia, *L.*
discolor, *Pursh.*
Douglasii, *Hook.*
expansa, *Wall.*
japonica, *L. f.*
— var. glabrata, *Nichols.*
lindleyana, *Wall.*
nobleana, *Hook.*
notha, *Zabel.*

Spiraea, *cont.*
salicifolia, *L.*
sorbifolia, *L.*
tomentosa, *L.*

Staphylea pinnata, *L.*

Symphoricarpus Heyeri, *Dippel.*
mollis, *Nutt.* var. ciliatus, *Nutt.*
orbiculatus, *Moench.*
racemosus, *Michx.*
rotundifolius, *A. Gray.*

Syringa Emodi, *Wall.*
— var. rosea, *Cornu.*
pekinensis, *Rupr.*
persica, *L.*

Tamarix tetrandra, *Pall.*

Taxus baccata, *L.*
cuspidata, *Sieb. & Zucc.*

Tecoma radicans, *Juss.*

Thuja gigantea, *Nutt.*
japonica, *Maxim.*
occidentalis, *L.*
— var. Dicksoni.
orientalis, *L.*

Tilia argentea, *Desf.*
cordata, *Mill.*
petiolaris, *DC.*
platyphyllus, *Scop.*
vulgaris, *Hayne.*

Ulex europaeus, *L.*
nanus, *Forst.*

Ulmus campestris, *L.*

Vaccinium Arctostaphylos, *L.*
corymbosum, *L.*
— var. amoenum, *A. Gray.*
erythrocarpum, *Michx.*
hirsutum, *Buckl.*
ovatum, *Pursh.*
pensylvanicum, *Lam.*

Viburnum acerifolium, *L.*
burejaeticum, *Regel & Herd.*
cassinoides, *L.*
dentatum, *L.*

Viburnum, *cont.*
- dilatatum, *Thunb.*
- Lantana, *L.*
- molle, *Michx.*
- nudum, *L.*
- Opulus, *L.*
- prunifolium, *L.*
- Tinus, *L.*

Vitis aestivalis, *Michx.*
- amurensis, *Ruprecht.*

Vitis, *cont.*
- inconstans, *Miq.*
- Labrusca, *L.*
- riparia, *Michx.*
- vinifera, *L.* var. laciniosa.

Widdringtonia Whytei, *Rendle.*

Zenobia speciosa, *D. Don.*
- — var. pulverulenta.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1899.

NEW GARDEN PLANTS OF THE YEAR 1898.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1898. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1898, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and botanical varieties, all hybrids, whether introduced or of garden origin, with botanical names, and described for the first time in 1898, are included. It has not been thought desirable, however, to give authorities after the names of garden hybrids in such genera as *Cypripedium*, &c. Mere garden varieties of such plants as *Coleus*, *Codiæum* or *Narcissus* are omitted for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

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An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviation used to indicate them, are as follows:—*B. B.*—Bulletin de L'Herbier Boissier. *B. H. N.*—Bulletin du Museum d'histoire naturelle, Paris. *B. M.*—Botanical Magazine. *B. T. O.*—Bulletino della R. Società Toscana di Orticultura. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *Jard.*—Le Jardin. *J. B.*—Journal de Botanique. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société nationale d'horticulture de France. *K. B.*—Bulletin of Miscellaneous Information, Royal Gardens, Kew. *L.*—Lindenia. *Lem. Cat.*—Lemoine, Plantes Nouvelles. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. K.*—Monatsschrift für Kakteenkunde. *N. B.*—Notizblatt des Königl. botanischen Gartens und Museums zu Berlin. *N. G. M.*—Dr. Neubert's Garten-Magazin. *O. R.*—Orchid Review. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Späth Cat.*—L. Späth, General Nursery Catalogue. *S. H.*—La Semaine Horticole. *W. G.*—Wiener Illustrirte Garten-Zeitung.

The abbreviations in the descriptions of the plants are:—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

***Acalypha godseffiana,** M. T. Masters. (*G. C.* 1898, xxiii., 241, f. 87.) Urticaceæ. S. A low-growing shrub of dense bushy habit, with ovate, toothed leaves, 6 in. long, green margined with pale yellow. New Guinea. (F. Sander & Co.)

Acanthophippium Curtisii albidum. (*L.* t. 619.) Orchidaceæ. S. This differs from the type in having the lateral lobes of the lip and the outside of the sepals white. Malayan Archipelago. (L'Horticulture Internationale, Brussels)

Acer Negundo californicum aureum. (*R. H.* 1898, 327.) Sapindaceæ. H. A form of the Californian Box Elder with golden leaves. (Levasseur & Son, Ussy, Calvados, France.)

***Aceras bolleana,** Siehe. (*G. C.* 1898, xxiii., 365, f. 133.) Orchidaceæ. H. A terrestrial species, growing about 18 in. high. The leaves are broad, and the flowers green and rosy red. Asia Minor. (W. Siehe, Mersina.)

Acidanthera Gunnisii, Rendle. (*G. C.* 1898, xxiv., 33.) Iridaceæ. G. A species with perianth tube 4 to 5 in. long; perianth white or faintly-tinged with rose-purple; stamens half as long as the perianth segments. Somaliland. (Cambridge B. G.)

Alocasia spectabilis. (*G. C.* 1898, xxiv., 293.) Araceæ. S. Very similar to *A. putzeysiana;* leaves large, metallic green, veined and laced with grey, the underside dark purple. (J. Veitch & Sons, Ltd.)

Alocasia wavriniana, M. T. Masters. (*G. C.* 1898, xxiii., 241, f. 89.) S. Leaves forming a dense erect tuft, stalked, lanceolate; blade 20 in. long, 6 in. wide, pinnately lobed, blackish green grey on the under surface; stalks purplish spotted with green. Celebes. (F. Sander & Co.)

***Aloe leptophylla,** N. E. Brown. (*B. M.* t. 7624.) Liliaceæ. S. Nearly allied to *A. latifolia*, differing in having thinner leaves. Stem short, 2 in. diam.; leaves 20 in a rosette, 1 ft. long, 3 in. wide, green striped and spotted with grey; marginal teeth large. Peduncle simple erect, 18 in. long bearing a capitate raceme of flowers 1½ in. long, bright orange coloured tipped with green, the stamens deep orange. South Africa. (Kew.)

Aloe Schweinfurthii, Baker. (*G. C.* 1898, xxiii., 197.) S. Leaves suberect, thick, 2½ ft. long and 7 in. wide, glaucous green; marginal teeth distant; flower scape erect, freely branched, 3½ ft. high; flowers coral pink. Cent. Africa. (T. Hanbury, La Mortola.)

***Amomum hemisphæricum,** J. G. Baker. (*B. M.* t. 7592.) Scitamineæ. S. Habit of *Alpinia nutans*, the stems 12 ft. high, leaves $1\frac{1}{2}$ ft. long, 3 in. wide, green above, claret red beneath. Peduncle stout, 8 in. long, erect, springing direct from the rhizome, sheathed and bearing a globose head of red and yellow flowers surrounded by large dull-red bracts. Java. (Kew)

***Anemopægma carrerense,** Armitage. (*Journal of Botany*, 1898, 188.) Bignoniaceæ. S. A climbing shrub, with pale citron-yellow flowers, nearly related to *A. racemosum*, Mart. Trinidad.

***Acrostichum Lindeni.** (*G. C.* 1898, xxiv., 333.) Filices. S. A distinct species resembling in habit *Adiantum reniforme*, but fronds much thicker, stalks 1 to 3 in. long, blade brittle, 3 in. across, glaucous-green, without any distinct mid-rib. Guatemala. (Linden.) [*Scolopendrium nigripes*, Hook.]

***Adenophora Potanini.** (*Gfl.* 1891, 584, f. 118.) Campanulaceæ. H. A branching perennial with pendulous, bell-shaped, bright blue flowers. (Haage & Schmidt, Erfurt.)

***Adiantum hemsleyanum.** (*G. C.* 1898, xxiii., 332, f. 124.) Filices. S. A seedling form of *A. cuneatum*. (H. B. May.)

Æchmea cylindrata, Lindm. (*Gfl.* 1898, t. 1447.) Bromeliaceæ. S. A species nearly allied to *Æ. aureo-rosea* and *Æ. nudicaulis*, but with violet-blue corollas—calyx, bracts, &c., soft rose-colour. Brazil. (Breslau B. G.)

Aerides ledouxianum. (*G. C.* 1898, xxiv., 134.) Orchidaceæ. S. Said to be similar to *A. odoratum*. No description. (R. Le Doux.)

Alocasia plumbea. (*G. C.* 1898, xxiii., 254.) Araceæ. S. Leaves large, dark green, crinkled with purplish petioles. Hab.? (De Smet-Duvivier, Ghent.)

Anthurium crystallinum illustre. (*G. C.* 1898, xxiv., 293; 417, f. 119.) Araceæ. S. Leaves blotched with cream-yellow. Apparently the same as var. *variegatum*, introduced in 1893. (R. Gulzow.)

Aralia balfouriana. (*G. C.* 1898, xxiii., 250.) Araliaceæ. S. Leaves trifoliolate, the segments rounded, green with white edges. New Caledonia. (F. Sander & Co.)

***Areca Ilsemanni.** (*G. C.* 1898, xxiii., 331.) Palmæ. S. Leaves pinnate, arching, the rhachis dark red, pinnæ rich green, dark brown when young. Pacific Isles. (F. Sander & Co.)

Arisæma Lackneri. (*N. B.* 1898, 186.) Araceæ. S. A species allied to *A. speciosum*, *A. intermedium* and *A. costatum*, but differing from all in the very long-tailed spathe. Burma. (Berlin B. G.)

Arum Eggeri. (*S. H.* 1898, 395.) Araceæ. Nearly allied to or perhaps identical with *A. spectabile* or *A. Dioscoridis*. (Krelage & Son, Haarlem.)

***Arundinaria metallica,** Mitford. (*G. C.* 1898, xxiv., 274, f. 78.) Gramineæ. H. Very like *A. Veitchi* in character, but bolder and stronger, and does not wither at the edges in winter like *A. Veitchi*. Japan. (A. B. Mitford.)

Asparagus Sprengeri compacta. (*G. C.* 1898, xxiv., 445.) Liliaceæ. S. Differs from the type only in its dwarf habit, never exceeding 18 in. in height. (H. B. May.)

Asparagus Sprengeri variegata. (*G. C.* 1898, xxiii., 250.) G. A form with silvery variegated phylloclades. (M. Rigout, Ghent.)

***Asphodeline Balansæ.** (*G. C.* 1898, xxiii., 111 f. 43.) Liliaceæ. H. A fine plant with the habit of a *Dasylirion*. The flowers are white and are borne on a stem destitute of scales. Cilicia and Cappadocia. (W. Siehe.)

***Asphodeline Basilii,** Siehe. (*G. C.* 1898, xxiii., 111.) H. A species with ovate-oblong fruits. Mount St. Basil, near Cæsareæ. (W. Siehe.)

***Asphodeline dammeriana,** Siehe. (*G. C.* 1898, xxiii., 111.) H. A species with a branching inflorescence bearing white flowers. Cilicia and Cappadocia. (W. Siehe.)

***Asphodeline isthmocarpa,** F. Gay. (*G. C.* 1898, xxiii., 111, f. 44.) H. This species has an irregular inflorescence and larger flowers than *A. Balansæ*. The fruit is constricted in the middle. Height 5 ft. Cilicia and Cappadocia. (W. Siehe.)

***Asplenium Mayi.** (*G. C.* 1898, xxiii., 372, f. 140.) Filices. S. Described

as a pretty fern, with dark green, shining, pinnate, dentate fronds of hard texture. (H. B. May.)

***Asplenium Nidus multilobatum,** F. M. Bailey. (*G. C.* 1898, xxiii., 21, f. 8.) S. A variety with the upper portion of the fronds lobed or pinnatifid and which is reproduced true from spores. N. Queensland. (Kew.)

Billbergia hybrida hœlscheriana. (*Gfl.* 1898, 286, f. 76.) Bromeliaceæ. S. A garden hybrid between *B. nutans* and *B. Saundersii.* (Georg Kittel, Eckersdorf, Silesia.)

Boucerosia munbyana hispanica. (*J. B.* 1898, 251.) Asclepiadaceæ. G. A form with narrow corolla-lobes. Caravaca, Spain. (A. de Coincy.)

Brasso-cattleya lindleyano-elegans. (*O. R.* 1898, 30.) Orchidaceæ. G. A garden hybrid between *Brassia lindleyana* and *Lælio-cattleya elegans.* (Sir Trevor Lawrence.)

Bulbophyllum spectabile, Rolfe. (*K. B.* 1898, 193; *O. R.* 1898, 303.) Orchidaceæ. S. A new species allied to *B. striatum.* Pseudobulbs ovoid, 1 in. long; leaf elliptic, leathery, 2 in. long; scape short, bearing one pale green, brown-spotted flower 2 in. across, the sepals ovate, concave, the petals longer, narrower and recurved, the lip fleshy recurved, with reflexed toothed margins. Assam. (Glasnevin.)

***Caladenia carnea,** R. Br. (*B. M.* t. 7630.) Orchidaceæ. G. A small terrestrial orchid with pea-like tubers, slender stems 6–12 in. high bearing hairy grass-like leaves 8 in. long. Scape erect 8 in. long bearing 2–4 flowers 1 in. wide with similar sepals and petals, white, pink or pinkish green, lip channelled, with glandular margins. Australia and Tasmania. (Kew.)

Calamus Caroli. (*G. C.* 1898, xxiii., 250.) Palmæ. S. "A pinnate leaved twining palm with spreading spines." Hab.? (F. Sander & Co.)

***Calandrinia Tweedyi,** A. Gray. (*Gard.* 1898, liii., 420.) Portulacaceæ. G. A dwarf tufted plant, with thick fleshy leaves. The flowers are bright red in bud, flesh colour edged with bronze when fully expanded. Oregon.

Calanthe labrosior. (*O. R.* 1898, 374.) Orchidaceæ. S "A new hybrid with white flowers tinged with blush on the lip above the pale primrose base." (Sir T. Lawrence.)

***Calliandra fulgens,** Hook. f. (*B. M.* t. 7626.) Leguminosæ. S. Allied to *C. hæmatocephala*, but with larger leaflets and a looser habit. It forms a bush with spreading branches, brown bark and bipinnate leaves; pinnæ linear oblong, red-brown when young. Flowers in dense heads $2\frac{1}{2}$ in. diam., bright crimson. Mexico. (Kew.)

Calochortus Purdyi. (*G. C.* 1898, xxiii., 394, 395, f. 147.) Liliaceæ. H. A species with silvery white flowers borne on stems 9 in. high. The hairy petals have a purple base. California. (R. Wallace & Co.)

Calystegia affinis, Endl. (*G. C.* 1898, xxiv., 33.) Convolvulaceæ. H. "Regarded as a geographical form of our native *C. sepium.*" Norfolk Island. (Cambridge, B. G.)

***Campanula betulæfolia,** *C. Koch.* (*G. C.* 1898, xxiv., 424.) Campanulaceæ. H. A dwarf plant with creamy white flowers. Armenia. (Max Leichtlin.)

***Camptosema pinnatum,** Benth. (*B. M.* t. 7582.) Leguminosæ. S. A woody shrub, with drooping pinnate leaves, the leaflets ovate, 6 in. long. Flowers in a short stout raceme, each 2 in. long, with a large green bell-shaped calyx and rose-red petals folded, giving the appearance of a small club. Brazil. (Kew.)

Catalpa hybrida. (*Gfl.* 1898, 481, t, 1454.) Bignoniaceæ. H. A garden hybrid between *C. Kæmpferi* and *C. bignonioides.* (L. Späth, Berlin.)

Cattleya aurea. (*L.* tt. 598, 599.) S. Orchidaceæ. In the work quoted the following forms are figured, *aurantiaca, chotekiana, grandis, magnifica, musaica, splendens.* (L. Linden & Co. Mortebeek, Belgium.)

Cattleya dowiana imschootiana. (*O. R.* 1898, 334.) S. A variety with sepals and petals white tinged with yellow and the lip coloured as in the type. (W. S. McMillan.)

Cattleya hardyana fanyauiana. (*L.* t. 593.) S. A finely-coloured form of a supposed natural hybrid. (L. Linden & Co., Mortebeek, Belgium.)

Cattleya luddemanniana Maroni. (*J. H. F.* 1898, 538.) S. A large-flowered variety with a deep carmine-throated lip, striped with bright red and bordered with yellow. (Piret, Argenteuil.)

Cattleya Mariæ-Ludovicæ. (*R. H.* 1898, 395.) S. A garden hybrid between *C. Mossiæ* and *C. Forbesi.* (G. Mantin, Orleans.)

Cattleya Maroni. (*O. R.* 1898, 351; *G. C.* 1898, xxiv., 332, f. 98.) S. A garden hybrid between *C. velutina* and *C. dowiana aurea.* (C. Maron, Brunoy, France.)

Cattleya Pineli-aurea. (*J. H. F.* 1898, 770.) S. A garden hybrid whose parentage is indicated by the name. (Cappe et fils Vésinet, France.)

Cattleya pumila amabilis. (*L.* t. 627.) S. A form with the sepals, petals and tube of the lip white, the anterior lobe of the lip with wavy margins, flushed with pale rosy-lilac. (L'Horticulture Internationale, Brussels.)

Cattleya Schrœderæ amabilis. (*O. R.* 1898, 159.) S. A variety with flowers of peach-colour and deep orange in the throat. (J. Veitch & Sons.)

Cattleya Thorntoni. (*O. R.* 1898, 359.) S. A garden hybrid between *C. luddemanniana* and *C. amethystoglossa.* (T. W. Thornton.)

Cattleya Trianæ. (*L.* t. 612.) S. The following varieties are here figured, *albo-rosea*, *bicolor*, *cincta.* (L. Linden & Co., Brussels,)

Cattleya Trianæ samyana. (*L.* t. 631.) S. A form with very light-coloured lilac-rose sepals and petals; lip violet-red shading into mauve near the fringed wavy edges, disk golden yellow. (L. Linden & Co., Brussels.)

Cattleya Trianæ Villegontieriæ. (*L.* t. 637.) S. A form with lilac-rose flowers; disk yellow striped with gold and brownish red. (L. Linden & Co., Brussels.)

Cattleyodendron bellaerense. (*S. H.* 1898, 245.) Orchidaceæ. S. A garden hybrid between *Cattleya Forbesi* and *Epidendrum cochleatum.* (G. Mantin, Orleans.)

***Ceratolobus micholitzianus.** (*G. C.* 1898, xxiii., 213, f. 97.) Palmæ. S. Elegant palm; stem and leaves clothed with long spines; leaflets scattered, linear oblong, fascicled. Hab.? (F. Sander & Co.)

***Chelidonium leptopodum,** Prain. (*G. C.* 1898, xxiv., 33.) Papaveraceæ. H. A species of tufted habit bearing numerous medium sized yellow flowers. China.

Chondrorhyncha albicans, Rolfe. (*K. B.* 1898, 195; *O. R.* 1898, 303.) Orchidaceæ. S. A new species allied to *C. lendyana.* Leaves in a rosette, lanceolate, 4 in. long; scape short, one-flowered; flowers 1 in. across, white tinged with green. Costa Rica. (Hon. W. Rothschild.)

Cineraria stellata. (*G. C.* 1898, xxiii., 239.) Compositæ. G. A seedling form of *C. cruenta.* (Sutton & Sons.)

***Cirsium candissimum,** Dammer. (*G. C.* 1898, xxiii., 161.) Compositæ. H. An annual, growing about 10 ft. high, the leaves being long and broad, and, as the whole plant, silvery white. Flowers rose colour. Cappadocia. (W. Siehe.)

Cochlioda nœtzliana superba. (*L.* t. 640.) Orchidaceæ. G. A form with larger and more deeply-coloured flowers than the type.

Cœlogyne pulchella, Rolfe. (*K. B.* 1898, 194; *O. R.* 1898, 303.) Orchidaceæ. S. A new species allied to *C. longipes.* Pseudobulbs egg-shaped, 2½ in. long; leaves 6 in. long, 1 in. wide; scapes 6 in. long; flowers 1 in. across, pure white with a brown blotch on the lip. Trop. Asia. (J. W. Moore.)

***Coleus thyrsoideus,** Baker. (*G. C.* 1898, xxiii., 79.) Labiatæ. G. A new species with triangular toothed green leaves 2½ in. wide and terminal thyrsoid spikes of bright blue flowers, produced in winter. Brit. Cent. Africa. (Kew.)

***Cordyline Eckhautii.** (*G. C.* 1898, xxiv., 293.) Liliaceæ. G. Apparently a form of *C. australis*; leaves green, gracefully recurved. (J. Veitch & Sons, Ltd.)

Correvonia bellaerensis. (*S. H.* 1898, 346.) Orchidaceæ. S. A garden

hybrid between *Brassovola Perrini picta* and *Cattleya guttata*. (G. Mantin, Orleans.) [*Brasso-cattleya.*]

Cotula pyrethrifolia, Hook. f. (*G. C.* 1898, xxiii., 50.) Compositæ. H. A dwarf creeping plant with small fern like foliage. New Zealand. (H. Correvon, Geneva.)

***Cotula squalida,** Hook. f. (*G. C.* 1898, xxiii., 50.) H. Dwarf and creeping, with foliage similar to *Asplenium fontanum*. New Zealand. (H. Correvon.)

Cypripedium albertianum punctatum. (*J. H. F.* 1898, 43.) Orchidaceæ. S. A garden hybrid between *C. insigne Wallacei* and *C. spicerianum*. (Peeters, Brussels.)

Cypripedium Ansoni. (*S. H.* 1898, 314.) S. A garden hybrid between *C. rothschildianum* and *C. Morganiæ*. (Low & Co.)

Cypripedium Argo-Morganiæ. (*O. R.* 1898, 374.) S. A garden hybrid between the species indicated by the name. (Sir T. Lawrence.)

Cypripedium Chantini - ciliolare. (*S. H.* 1898, 114.) S. The parents of this hybrid are indicated by the name. (M. Alfred Bleu, Paris.)

Cypripedium colombense. (*J. H. F.* 1898, 1235.) S. A garden hybrid between *C. nitens superbum* and *C. Curtisii*. [M. Bert, Colombes (Seine).]

Cypripedium Crawshawæ, J. O'Brien. (*G. C.* 1898, xxiii., 18.) S. A new species resembling *C. Charlesworthii* in form and *C. insigne Sanderæ* in colour of flower. Shan States. (J. Charlesworth & Co.)

Cypripedium exoptatum. (*J. H. F.* 1898, 707.) S. A garden hybrid between *C. barbato-Veitchi* and *C. ciliolare*. (M. Bleu, Paris.)

Cypripedium Gautieri. (*J. H. F.* 1898, 1105.) S. A garden hybrid between *C. callosum* and *C. leeanum*. (Dr. Fournier, Neuilly-sur-Seine.)

Cypripedium germinyanum superbum. (*J. H. F.* 1898, 169.) S. A garden hybrid between *C. hirsutissimum* and *C. villosum*. (Cappe et fils, Vésinet.)

Cypripedium lawrenceanum gratrixianum. (*O. R.* 1898, 217.) S. A new form in the way of *hyeanum*, but petals and pouch flushed with red. (S. Gratrix.)

Cypripedium leeano-chamberlainianum. (*J. H. F.* 1898, 50.) S. Said to be the first hybrid raised from *C. chamberlainianum*. (M. Page, Bougival, France.)

Cypripedium Leonis. (*J. H. F.* 1898, 961.) S. A garden hybrid between *C. Boxalli* and *C. leeanum*. (Cappe et fils, Vésinet, France.)

Cypripedium Margaritæ. (*J. H. F.* 1898, 282.) S. A garden hybrid between *C. spicerianum* and *C. villosum*. (Opoix, Paris.)

Cypripedium palawanense. (*S. H.* 1898, 404.) S. Supposed to be a natural hybrid between *C. dayanum* and *C. rothschildianum*. Borneo. (Low & Co.)

Cypripedium roseum. (*J. H. F.* 1898, 43.) S. A garden hybrid between *C. spicerianum* and *C. Sallieri hyeanum*. (Peeters, Brussels.)

Cypripedium rothschildianum platytoenium. (*L.* t. 623.) S. A form with flattened petals, and more deeply-coloured flowers than the type. (L. Linden & Co., Brussels.)

Cypripedium scitulum. (*J. H. F.* 1898, 351.) S. A garden hybrid between *C. spicerianum* and *C. chamberlainianum*. (Cappe et fils, Vésinet.)

Cypripedium Shipwayæ. (*S. H.* 1898, 503.) S. A natural hybrid between *C. Hookeræ* and *C. dayanum*. Borneo. (Col. Shipway.)

Cypripedium sybirolense. (*J. H. F.* 1898, 289.) S. A garden hybrid between *C. Boxallii* and *C. insigne*. (M. Martin-Cahuzac.)

Cypripedium villoso-chamberlainianum. (*S. H.* 1898, 114.) S. A garden hybrid between the two species indicated by the name. (Cappe et fils, Vésinet, France.)

Cypripedium wiertzianum. (*L.* t. 644.) S. A garden hybrid between *C. rothschildianum* and *C. lawrenceanum*. (L'Horticulture Internationale, Brussels.)

Cypripedium wincqzianum. (*L.* t. 620.) S. A garden hybrid between *C. harrisianum superbum* and *C. haynaldianum.* (L'Horticulture Internationale, Brussels.)

Cypripedium Wottoni. (*O. R.* 1898, 373.) S. A garden hybrid between *C. bellatulum* and *C. callosum.* (R. J. Measures.)

***Cyrtosperma senegalense,** Engl. (*B. M.* t. 7617.) Araceæ. S. A subaquatic plant with a fleshy tuber and the habit of a Colocasia, but the leaves are firmer, the petioles spinous and the blade sagittate. Peduncle 5 ft. (12 ft. in wild examples) high bearing an erect oblong-lanceolate spathe a foot long, folded at the base, pale green with broad interrupted bands of maroon; spadix much shorter than the spathe, cylindric, dark violet-purple. Upper Guinea. (Kew.)

***Dasystachys Drimiopsis,** Baker. (*B. M.* t. 7580.) Liliaceæ. S. Closely allied to *Anthericum.* Leaves linear, bright green, spotted red at base, 1 ft. long; scape erect 2 ft. or more long, bearing a dense raceme, 4 in. long, of small white flowers with yellow anthers. Brit. Cent. Africa. (Kew.)

Davallia fijiensis effusa. (*G. C.* 1898, xxiii., 332, f. 118.) Filices. S. A robust variety with fronds 5 ft. long. (H. B. May.)

Delphinium caucasicum. (*Gfl.* 1898, 424.) Ranunculaceæ. H. A perennial with sparingly-branched inflorescence of bright blue flowers. Caucasus. (Haage & Schmidt, Erfurt.)

Dendrobium cymbiforme, Rolfe. (*K. B.* 1898, 192; *O. R.* 1898, 302.) Orchidaceæ. S. A new species allied to *D. hamatum,* with erect terete slender pseudobulbs 6–12 in. long, and two-flowered axillary racemes of flowers 1 in. across, straw-yellow striped with purple. Sumatra. (L. Kienast, Zurich.)

Dendrobium dalhousieanum salmoneum. (*O. R.* 1898, 190.) S. Distinct in having salmon pink instead of maroon blotches on the labellum. (Low & Co.)

Dendrobium formoso-Lowii. (*O. R.* 1898, 374.) S. A garden hybrid between the species indicated by the name. (Sir T. Lawrence.)

Dendrobium hirtulum, Rolfe. (*K. B.* 1898, 193; *O. R.* 1898, 302.) S. A new species allied to *D. stuposum.* Stems terete, fleshy, a foot long; leaves oblong 2 in. long; racemes lateral, 4 in. long, each bearing 4 flowers coloured bright yellow with streaks of red on the sides of the lip. ? Burma. (H. Grose-Smith.)

Dendrobium nobile ashworthianum. (*O. R.* 1898, 120.) An albino variety. (E. Ashworth.)

Dendrobium nobile Robsonæ. (*O. R.* 1898, 130.) S. A variety with large flowers, the petals being 1 in. across and the labellum even larger, and very brightly coloured. (J. Robson.)

Dendrobium radians, Reichb. f. (*O. R.* 1898, 211.) S. Described by Reichenbach in 1863 from a plant imported from Borneo along with *D. Lowii.* Rolfe suggests that it is a natural hybrid between the last named species and *D. sculptum.* It has white flowers with an orange blotch on the lip. (Low & Co.)

***Deutzia gracilis rosea.** (*Lem. Cat.* No. 140, ix.) Saxifragaceæ. H. A garden hybrid between *D. gracilis* (male) and *D. discolor purpurascens.* (Lemoine, Nancy.)

***Deutzia gracilis venusta.** (*Lem. Cat.* No. 140, ix.) H. A garden hybrid between *D. gracilis* (male) and *D. discolor purpurascens.* (Lemoine.)

***Dianthus superbus sinensis.** (*Gard.* 1898, liv., 404.) Caryophyllaceæ. H. A variety growing 2 ft. high, with much-branched inflorescence, and heavily fringed purplish-mauve flowers. China. (Kew.)

***Didiera mirabilis,** Baillon. (*G. C.* 1898, xxiii., 110, f. 42.) ? Sapindaceæ. S. A new genus of anomalous character. It has a succulent stem, suggesting *Euphorbia,* bearing long needle-like spines and narrow fleshy leaves. The flowers are said to be produced in pendulous tufts and to consist of three pairs of alternate rose-coloured leaflets. Madagascar. (M. A. Grandidier.)

Dieffenbachia kerchoveana. (*G. C.* 1898, xxiii., 254.) Araceæ. S. Similar to *D. Jenmani,* but with leaves four times as large and with spots confluent. (De Smet-Duvivier, Ghent.)

*__Dodecatheon Hendersoni__, A. Gray. (*Gard.* 1898, liii., 246.) Primulaceæ. H. A dwarf species about 6 inches high bearing bright crimson flowers with a yellow ring.

__Dolichos sudanensis.__ (*B. T. O.* 1898, 56, t. 3.) Leguminosæ. G. Apparently a form of the widely cultivated *D. Lablab.* (Angioli Pucci, Florence.)

*__Dorstenia arabica__, Hemsley. (*G. C.* 1898, xxiii., 354.) Urticaceæ. S. Stem short, fleshy, bearing a few ovate wrinkled leaves, greyish green; inflorescence disc-like, an inch wide with ray-like lobes. Arabia. (Cambridge, Kew.)

__Dracæna aureo-striata.__ (*G. C.* 1898, xxiii., 238.) Liliaceæ. S. A broad leaved Dracæna; green variegated with yellow. (H. Low & Co.)

__Echinocactus denudatus__, Link and Otto. (*M. K.* 1898, 36.) Cactaceæ. G. Here are described the following varieties:—*andersohnianus, brunnowianus, de lætianus, heuschkelianus, meiklejohnianus, scheidelianus, wagnerianus, wieditzianus.* (Ferd. Haage, junr.)

__Epicattleya radiato-bowringiana.__ (*O. R.* 1898, 198; *G. C.* 1898, xxiii., 391, f. 146.) Orchidaceæ. S. A garden hybrid between *Cattleya bowringiana* and *Epidendrum radiatum.* (J. Veitch & Sons.)

__Epidendrum organense__, Rolfe. (*K. B.* 1898, 194; *O. R.* 1898, 303.) G. A new species allied to *E. calamarium*, but dwarfer, the whole plant being less than 3 in. high. Pseudobulbs oblong, one-leaved; raceme short, bearing a few small dull yellow flowers, marbled and lined with brown-purple. Brazil. (F. Sander & Co.)

__Epidendrum radicanti-stamfordianum.__ (*O. R.* 1898, 198.) G. A garden hybrid between the two species indicated by the name. (J. Veitch & Sons.)

__Epilælia Charlesworthii.__ (*O. R.* 1898, 169.) Orchidaceæ. S. A garden hybrid between *Lælia cinnabarina* and *Epidendrum radicans.* (Charlesworth & Co.)

__Epilælia falcato-tenebrosa.__ (*S. H.* 1898, 26.) S. A garden hybrid between the species indicated by the name. (G. Mantin, Orleans.)

*__Eria latibracteata__, Rolfe. (*B. M.* t. 7605.) Orchidaceæ. S. Nearly allied to *E. bractescens.* Pseudobulbs fusiform or ovate 1–3 in. long, striate, 2-leaved, leaves ovate 2–4 in. long. Raceme basal 4 in. long, green mottled with red and bearing conspicuous boat-shaped green bracts; flowers fleshy ½ in. long, pale tawny yellow, lip canary yellow and purple. Borneo. (Kew.)

*__Eryngium glaciale__, Boiss. (*G. C.* 1898, xxiii., 283.) Umbelliferæ. H. A dwarf species about 3 in. high. The bracts are spinose and light blue in colour. Sierra Nevada. (H. Correvon.)

*__Eschscholtzia Douglasi__, Benth. (*Gfl.* 1898, 424.) Papaveraceæ. H. "The flowers of this are intermediate in size between those of *E. californica* and *E. tenuifolia:* they are golden yellow with a darker centre and open a fortnight earlier than those of the above-mentioned species." California. (Haage & Schmidt, Erfurt,)

*__Euphorbia lophogona__, Lam. (*G. C.* 1898, xxiv., 378.) Euphorbiaceæ. S. Stem short, four-angled; leaves obovate; green, fleshy; flowers as in *E. splendens*, but shorter in the peduncle; bracts coloured pink. Madagascar. (Kew.)

*__Feijoa sellowiana__, Berg. (*B. M.* t. 7620; *G. C.* 1898, xxiv., 451, f. 134.) Myrtaceæ. S. A *Psidium*-like plant, forming a shrub or small tree with numerous branches, wrinkled ovate opposite leaves 2 in. long and solitary axillary flowers, 2 in. wide, calyx reflexed, hairy; corolla of 5 orbicular, concave fleshy petals, white tomentose outside, blood red inside; stamens very numerous, forming a purple brush-like tuft nearly an inch long. Fruit guava-like, aromatic, edible. Brazil and Uruguay. (M. André, Golf St. Juan.)

*__Felicia echinata.__ (*G. C.* 1898, xxiii., 308.) Compositæ. G. A shrub with the habit and foliage of a *Lasiosiphon*, and terminal heads of yellow aster-like flowers 1½ in. across. S. Africa. (Kew.)

__Forestiera neomexicana__, A. Gray. (*M. D. G.* 1898, 14.) Oleaceæ. H. A dwarf, branched, rigid, rather thorny bush with inconspicuous flowers and blue-black berries. N. W. America.

*__Furcræa watsoniana.__ (*G. C.* 1898, xxiii., 242, f. 90.) Amaryllidaceæ. S.

Habit of *F. gigantea;* leaves bluish green banded with cream yellow. Hab.? (Kew, and F. Sander & Co.)

*__Galanthus Elwesii Whittallii.__ (*G. C.* 1898, xxiv., 467.) Amaryllidaceæ. H. A distinct early flowering variety, with large flowers. Asia Minor. (Whittall.)

*__Geonoma pynærtiana.__ (*G. C.* 1898, xxiii., 258, f. 98.) Palmæ. S. Leaves densely tufted, spinous, with short stalks, bilobed, dentate, conspicuously ribbed, bright green. Malaya. (F. Sander & Co.) [An *Iguanura*, probably *I. diffusa*.]

Geranium Traversii, Hook. (*G. C.* 1898, xxiii., 284.) Geraniaceæ. H. A species with silvery leaves similar to *G. argenteum*, but larger. Flowers large, light purple, streaked with carmine. New Zealand. (H. Correvon.)

Geum speciosum, Alboff. (*G. C.* 1898, xxiii., 284.) H. Rosaceæ. A similar plant to *G. montanum*, but with larger leaves. Flowers bright orange yellow. Caucasus. (H. Correvon.)

Gladiolus quartinianus superbus. (*G. C.* 1898, xxiv., 467, f. 140.) Iridaceæ. G. Flowers larger than the type, yellow flushed with crimson. (Tillett.)

Gunnera insignis, Oerst. (*G. C.* 1898, xxiv., 32.) Haloragidaceæ. H. This species is here mentioned as growing in the Cambridge Botanic Garden. Chili.

Gypsophila Manginii. (*Jard.* 1898, 38.) Caryophyllaceæ. H. A perennial with thick fleshy roots, glabrous, very glaucous leaves and small panicles of rather large light rose-coloured flowers. Siberia. (H. Correvon, Geneva.)

Hæmanthus multiflorus superbus. (*G. C.* 1898, xxiv., 202.) Amaryllidaceæ. S. "A brilliant coloured improved form." (F. Sander & Co.)

*__Hæmanthus Nelsoni,__ Baker. (*K. B.* 1898, 310.) S. A new species with oblong compressed red bulbs 2 in. diam. and sessile, oblong leaves 1 ft. by 4 in., downy above, glabrous beneath. Scape 1 ft. long, hairy, bearing a globose head 3 in. across, of crowded red flowers. Transvaal. (Max-Leichtlin, Baden Baden.)

*__Hamamelis mollis,__ Oliver. (*G. C.* 1898, xxiv., 364.) Hamamelidaceæ. H. This differs from all the other cultivated species of the genus in its large broad leaves densely clothed beneath with a felt-like mass of stellate hairs. Flowers bright yellow like those of *H. arborea*. China. (J. Veitch & Sons, Ltd.)

*__Hemizonia pungens.__ (*G. C.* 1898, xxiv., 298.) Compositæ. G. A quick growing shrub with straggling white branches, bright green spinous leaves, and yellow flowers; not unlike a small *Helianthus*. California. (Kew.)

Hesperaloe Davyi, Baker. (*K. B.* 1898, 226.) Liliaceæ. G. A new species, closely allied to *H. yuccæfolia*, differing in its broader leaves and copiously branched panicle. Leaves 4 ft. long with brown marginal fibres. Panicle 12 ft. high, branches 1–2 ft. long; flowers 1 in. long, green and white. California? (University Garden, California.)

Heterospermum Xanthii. (*Gfl.* 1898, 429, f. 79.) Compositæ. H. A dwarf-growing composite in habit and inflorescence, much resembling the well-known *Sanvitalia procumbens*. California. [The correct name of this is *H. Xanti*, A. Gray.] (Dammann & Co., Naples.)

*__Hippeastrum Arechavaletæ,__ Baker. (*K. B.* 1898, 226.) Amaryllidaceæ. G. Very near to *H. vittatum* (*B. M.* t. 129) differing only in having the margins of the flower segments plain. Scape 2 ft. high, bearing an umbel of 3 flowers, each 4 in. long, $2\frac{1}{2}$ wide, white, banded with crimson. Monte Video. (Kew.)

*__Huernia somalica,__ N. E. Brown. (*K. B.* 1898, 309; *G. C.* 1898, xxiii., 254.) Asclepiadaceæ. S. A new species allied to *H. oculata*. Stems 3 in. long, five-angled, with acute teeth; pedicels $\frac{1}{3}$ in. long; flowers campanulate, $1\frac{1}{2}$ in. long, deep brown-purple with yellow spots on the corona. Somaliland. (Cambridge, Kew.)

*__Hyacinthus azureus,__ Baker var. **giganteus.** (*G. C.* 1898, xxiv., 190, f. 52.) Liliaceæ. H. A large form from Mount Muris in Northern Cilicia. (W. Siehe.)

*__Incarvillea grandiflora.__ (*G. C.* 1898, xxiv., 8.) Bignoniaceæ. G. A

new species similar to *I. Delavayi*, but with shorter leaves and leaflets, and a short scape bearing 1–2 flowers as large as those of *I. Delavayi*, and coloured rich rose red. China. (Kew.)

Iochroma flavum, E. André. (*R. H.* 1898, 360, t.) Solanaceæ. G. A bushy shrub about 6 ft. high with axillary clusters of pale yellow tubular flowers. Eastern slopes of the Cordilleras of Colombia. (E. André, France.)

***Iris Aitchisoni,** Baker. (*Gard.* 1898, liv., 102, t. 1182.) Iridaceæ. H. One of the so-called "Juno" group of bulbous Irises. The dominant colour of the flower is purple of one shade or other. The claw of the fall is marked by radiating purple veins on a creamy yellow ground, blade rich deep purple, orange crest. Punjab. (M. Foster.)

***Iris bosniaca,** Neck. (*Gard.* 1898, liii., 441.) H. A species growing 12 to 15 in. high, bearing clear yellow flowers. Bosnia. (R. Wallace & Co.)

***Ischarum eximium,** Schott & Kotschy. (*G. C.* 1898, xxiii., 126, f. 49.) Araceæ. H. A species with broad simple leaves. The spathe is dark purple on the upper side, and green spotted with red on the under side. Western Cilicia. (W. Siehe.)

***Jasminum nitidum,** Skan. (*K. B.* 1898, 225.) Oleaceæ. A stove climber with thin stems, simple lanceolate green leaves 3 in. long and few-flowered short racemes of fragrant white flowers ¾ in. long. Admiralty Islands. (W. Bull.)

***Kæmpferia Ethelæ,** J. M. Wood. (*G. C.* 1898, xxiii., 94, f. 34.) Scitamineæ. S. A new species in the way of *K. Kirkii*. Stem 8 in. high, afterwards lengthening to 2 ft.; leaves oblong lanceolate 1 ft. long; flowers solitary 4 in. wide, rose-purple with a blotch of yellow on the lip-like lower segments. Natal. (Kew, &c.)

***Kæmpferia macrosiphon,** Baker. (*G. C.* 1898, xxiv., 195.) S. Allied to *K. Kirkii*; leaves tufted, green, lanceolate, a foot long; flowers numerous on short peduncles; corolla-tube long, slender; lobes an inch long, blue, the lower one an inch wide. German East Africa. (Kew.)

Kentia kersteniana. (*G. C.* 1898, xxiv., 391, f. 113.) Palmæ. S. "A striking looking palm with leaves widely pinnate, the wedge-shaped leaflets curiously erose, and of a dark green tint." (F. Sander & Co.) [Probably a *Ptychosperma.*]

Lælia cinnabrosa. (*O. R.* 1898, 189.) Orchidaceæ. S. A garden hybrid between *L. cinnabarina* and *L. tenebrosa*. (Charlesworth & Co.)

Lælia prestans candida. (*L.* t. 625.) S. A white-flowered form. (L'Horticulture Internationale, Brussels.)

Lælia præstans Luciani. (*L.* t. 643.) S. A form with warm purple-rose sepals and petals, upper part of lip deep red-purple.

Lælia prestans nobilis. (*L.* t. 626.) S. A brightly-coloured form. (L'Horticulture Internationale, Brussels.)

Lælia pumila Colemanii. (*O. R.* 1898, 350.) G. A fine form with blush white sepals and petals and the front of the lip marked with purple and rose. (J. Coleman.)

Lælia purpurato-grandis. (*J. H. F.* 1898, 440.) S. A garden hybrid between *L. purpurata* and *L. grandis*. (G. Mantin, Orleans.)

Lælia ragotiana. (*J. H. F.* 1898, 438.) S. A garden hybrid between *L. grandis* and *L. cinnabarina*. (M. Ragot, Villenoy, Meaux.)

Lælia splendens. (*S. H.* 1898, 404.) S. A garden hybrid between *L. crispa* and *L. purpurata*. (Ingram.)

Lælio-cattleya Boreli. (*R. H.* 1898, 443.) Orchidaceæ. S. A garden hybrid between *Cattleya gaskeliana* and *Lælia purpurata*. (C. Maron, Brunoy, France.)

Lælio-cattleya callistoglossa. (*J. H. F.* 1898, 847.) S. A garden hybrid between *Lælia purpurata* and *Cattleya Gigas imperialis*. (C. Maron, Brunoy, France.)

Lælio-cattleya Cheremeteffiæ. (*L.* t. 615.) S. A natural hybrid between *Lælia tenebrosa* and *Cattleya Warneri*. [A form of *L. gottoiana*.] (L. Linden & Co., Brussels.)

Lælio-cattleya crispo-schilleriana. (*J. H. F.* 1898, 961.) S. A garden hybrid between *Lælia crispa* and *Cattleya schilleriana*. (Georges Mantin, Orleans.)

Lælio-cattleya dominiana langleyensis. (*O. R.* 1898, 349.) S. A garden hybrid between *Lælia purpurata* and *Cattleya dowiana.* (J. Veitch & Sons, Ltd.)

Lælio-cattleya duvaliana. (*S. H.* 1898, 316; *J. H. F.* 1898, 536.) S. A garden hybrid between *Lælia purpurata* and *Cattleya luddemanniana.* (C. Maron, Brunoy, France.)

Lælio-cattleya elegans. (*J. H. F.* 1898, 706.) S. A garden hybrid between *Cattleya amethystina* and *Lælia purpurata.* (C. Maron, Brunoy, France.)

Lælio-cattleya Haywoodii. (*O. R.* 1898, 124.) S. Supposed to be a garden hybrid much like *L. Hippolyta.* (T. B. Haywood.)

Lælio-cattleya hrubyana. (*L.* t. 610.) S. A supposed natural hybrid between *Lælia purpurata* and *Cattleya guttata.* Brazil. (L'Horticulture Internationale, Brussels.)

Lælio-cattleya illuminata. (*S. H.* 1898, 185.) S. A natural hybrid; supposed parentage not given. (L'Horticulture Internationale.)

Lælio-cattleya Ingramii gigantea. (*O. R.* 1898. 255.) G. Flowers 8 in. across, very rich in colour. (J. Veitch & Sons.)

Lælio-cattleya intermedio-flava. (*O. R.* 1898, 169.) G. A garden hybrid between *Cattleya intermedia* and *Lælia flava.* (Charlesworth & Co.)

Lælio-cattleya locusta. (*O. R.* 1898, 41.) G. A garden hybrid between *Cattleya bicolor* and *Lælia harpophylla.* (J. Veitch & Sons.)

Lælio-cattleya Mariæ-Piæ. (*R. H.* 1898, 395.) S. A garden hybrid between *Lælia purpurata* and *Cattleya Forbesii.* (G. Mantin, Orleans.)

Lælio-cattleya Pineli-aurea. (*S. H.* 1898, 356.) S. A garden hybrid between the plants indicated by the name. (Cappe et fils, Vésinet, France.)

Lælio-cattleya purpurato-gigas. (*J. H. F.* 1898, 777.) S. A garden hybrid mentioned in the list of New Plants for 1897 under name of *Lælio-cattleya parisiensis.* (C. Maron, Brunoy, France.)

Lælio-cattleya radiata. (*J. H. F.* 1898, 528.) A garden hybrid between *Lælia purpurata* and *Cattleya nobilior.* (C. Maron, Brunoy, France.)

Lælio-cattleya ridolfiana armainvillierensis. (*L.* t. 597.) S. A garden hybrid between *Lælia purpurata* and *Cattleya Mossiæ.* (Baron Edmond de Rothschild.)

Lælio-cattleya Sallieri. (*J. H. F.* 1898, 1235.) A garden hybrid between *Lælia purpurata* and *Cattleya Loddigesii.* (C. Maron, Brunoy, France.)

Lælio-cattleya tresederiana inversa. (*J. H. F.* 1898.) S. A garden hybrid between *Lælia crispa* and *Cattleya Loddigesii.* (G. Mantin, Orleans.)

Lælio-cattleya warnhamensis. (*O. R.* 1898, 124.) G. A garden hybrid between *Lælia cinnabarina* and some other unrecorded species. It is much like *L. Hippolyta.*

Lælio-cattleya weedoniensis. (*O. R.* 1898, 5.) S. A garden hybrid between *Lælia purpurata* and *Cattleya violacea* (*C. Loddigesii.*) (T. W. Thornton.)

Lælio-cattleya wellsiana langleyensis. (*O. R.* 1898, 159.) S. A garden hybrid between *Cattleya Trianæ* and *Lælia purpurata.* (J. Veitch & Sons.)

Leea rœhrsiana. (*G. C.* 1898, xxiii., 242, f. 92.) Ampelidaceæ. S. Stout shrub, with pinnate leaves 16 in. long; leaflets ovate, 6 in. long, toothed, bronzy-green when young, glaucescent when mature. Stem spotted with green. Malaya. (F. Sander & Co.) [*L. sambucina* var.]

Lepidium flexicaule, Kirk. (*G. C.* 1898, xxiii., 284.) Cruciferæ. H. A dwarf spreading plant with ornamental foliage. New Zealand. (H. Correvon.)

Licuala Leopoldii. (*G. C.* 1898, xxiii., 254.) Palmæ. S. A distinct little species, with small circular leaf-blades divided into spoke-like segments. Hab.? (F. Sander & Co.)

***Ligustrum Walkeri,** Decne. (*G. C.* 1898, xxiv., 282, f. 82.) Oleaceæ. G. A shrub or small tree with thin glabrous

oval-lanceolate leaves tapering to a very acute apex. Ceylon and Nilgiris. (Kew.)

*Lilium rubellum, Baker. (*G. C.* 1898, xxiii., 321, 335, f. 128.) Liliaceæ. H. A species near *L. japonicum*, from which it differs by its broad *speciosum*-like leaves and smaller pink flowers, with obtuse segments. Japan. (R. Wallace & Co.)

*Linospadix petrickiana. (*G. C.* 1898, xxiv., 298, f. 87.) Palmæ. S. An Areca-like palm with elegant pinnate leaves. New Guinea. (F. Sander & Co.)

Lissochilus arenarius. (*O. R.* 1898, 266.) Orchidaceæ. S. A species with flowers having green sepals suffused with purple brown, the broad petals and lip mauve purple, the spur yellow with a few dusky-brown dots. Trop. Africa. (Duc de Massa, Chateau de Franconville, France.)

*Livistona Woodfordi, Ridley. (*G. C.* 1898, xxiii., 177.) Palmæ. S. A new species near *L. australis*, but more elegant, with small flowers and fruit. Stem 40 ft. high; leaf-stalks slender (spinous?); blade orbicular, 18 in. across. Polynesia.

*Lobelia intertexta, Baker. (*K. B.* 1898, 157; *B. M.* t. 7615.) Campanulaceæ. H. H. An annual, 6 in. high with thin tufted hairy stems, orbicular toothed leaves tinged with purple beneath; flowers in loose terminal racemes each ½ in. diam., blue and white. Brit. Cent. Africa. (Kew.)

Lycaste Deppei præstans. (*L.* t. 639.) Orchidaceæ. G. A form with large finely-coloured flowers. Guatemala. (L'Horticulture Internationale, Brussels.)

Lycaste locusta, Reichb. f. (*O. R.* 1898, 136.) G. Allied to *L. costata*, with a white column, the rest of the flower being "grasshopper green." Flowers with sepals 2¼ in. long, lip fringed.

*Macroscepis elliptica, N. E. Brown. (*K. B.* 1898, 225.) Asclepiadaceæ. S. A stove climber with hairy stems, elliptic cordate hairy leaves 6 in. long and short umbels of subglobose olive-green flowers. Brazil. (F. Sander & Co.)

Mammillaria gigantea, Hildm. (*M. K.* 1898, 126.) Cactaceæ. G. A species, with greenish-yellow flowers, allied to *M. centricirrha*, Lem. Mexico.

Mammillaria kleinschmidtiana, Zeissold. (*M. K.* 1898, 21.) G. A provisional name for a Mexican plant the flowers of which are so far unknown.

Mammillaria Oettingenii, Zeissold. (*M. K.* 1898, 10.) G. An introduced plant not yet flowered in cultivation. Mexico.

Masdevallia angulata, Reichb. f. (*O. R.* 1898, 195.) Orchidaceæ. G. Allied to *M. mooreana*, from which it differs in having longer leaves and shorter scapes and perianth, the free parts of the sepals also being much less attenuate. Ecuador. (J. O'Brien.)

Maxillaria Augusta-Victoria. (*O. R.* 1898, 94.) Orchidaceæ. G. Allied to *M. sanderiana*, having white petals and sepals and a broad yellow lip with some purple markings. (Glasnevin.)

Maxillaria dichroma, Rolfe. (*K. B.* 1898, 196; *O. R.* 1898, 304.) G. A new species allied to *M. venusta*. Leaves oblong lanceolate 1 ft. long, scape 6 in. long, clothed with sheathing bracts; flowers 3 in. across white and brown-purple, lip margined with purple. Peru. (F. Sander & Co.)

Mikania Sanderi. (*G. C.* 1898, xxiii., 385.) Compositæ. S. A climber with large ovate, acuminate, green and purple leaves; flowers not known. (F. Sander & Co.)

Miltonia bleuana roseo-gigantea. (*O. R.* 1898, 188.) Orchidaceæ. S. A magnificent form with a lip 3 in. across. (J. Hye-Leysen, Ghent.)

Mimulus gracilipes. (*Gfl.* 1898, 425.) Scrophulariaceæ. H. A species with large, bright carmine-red white-throated flowers. California. (Haage & Schmidt, Erfurt.)

Mormodes œnanthum. (*O. R.* 1898, 158.) Orchidaceæ. S. Much like *M. buccinator* in form, but with claret-purple flowers. (Sir T. Lawrence.)

*Musa Bakeri, Hook. f. (*B. M.* t. 7627.) Scitamineæ. S. A new species of the *M. sapientum* group. Stem 10 ft. high, 8 in. diam. Leaves 7 ft. long

2 ft. wide, petiole 2 ft. long. Spike short; drooping flower bracts oblong, 6 in. long, deep crimson inside, intensely glaucous outside. Male flowers in clusters of 9 to 12. Immature fruit trigonous, dropping off before ripening. ? Cochin China. (Kew.)

Narcissus dubius, var. (*G. C.* 1898, xxiii., 222.) Amaryllidaceæ. H. A yellow variety of this species is here mentioned. (M. Foster).

***Nepenthes ventricosa,** Blanco. (*G. C.* 1898, xxiii., 380, f. 143.) Nepenthaceæ. S. A distinct and striking plant allied to *N. Burkei*. Leaves narrow, glabrous; pitchers green, with a red peristome, wingless, constricted in the middle, 6 in. long. Philippines. (Kew.)

***Nicotiana Bigelovii,** S. Wats. (*G. C.* 1898, xxiv., 284.) Solanaceæ. H. A night flowering annual species growing about 3 ft. high. The white flowers are freely produced, covering the plant with a sheet of bloom. North America. (Kew.)

***Nicotiana noctiflora albiflora,** Comes. H. H. (*Gfl.* 1898, 131, f. 39.) A form differing from the type in its grey-green slightly-hairy leaves and white flowers. (Dammann & Co., Naples.)

***Nicotiana sylvestris,** Spegaz. & Comes. (*Gfl.* 1898, 131, f. 138; *G. C.* 1898, xxiv., 284.) H. H. A very ornamental long-tubed white-flowered species with large grey-green leaves. Argentina. (Dammann & Co., Naples.)

Nidularium amazonicum treyerianum. (*G. C.* 1898, xxiii., 254.) Bromeliaceæ. S. A beautiful plant; leaves yellow with green stripes on the upper surface, crimson and green underneath. (M. Duprat, Bordeaux.)

Odontoglossum Adrianæ charlesianum. (*O. R.* 1898, 189.) Orchidaceæ. G. Differs from the type in having densely spotted flowers. (A. Madoux, Brussels.)

Odontoglossum Adrianæ crawshayanum. (*L.* t. 614.) Orchidaceæ. G. Supposed to be a natural hybrid between *O. crispum* and *O. hunnewellianum*. (L. Linden & Co., Brussels.)

Odontoglossum armainvillierense. (*J. H. F.* 1898, 1240.) G. A garden hybrid between *O. Pescatorei* and *O. crispum*. (Baron de Rothschild, Armainvilliers.)

Odontoglossum ashworthianum. *S. H.* 1898, 185.) G. A supposed natural hybrid between *O. Cervantesii* and *O. cordatum*. (E. Ashworth.)

Odontoglossum aspersum boschereanum. (*S. H.* 1898, 356.) G. A form differing from the type in its sulphur-yellow somewhat greenish petals with a few light plum-coloured spots at the base; lip pure white. (L. Linden & Co., Mortebeek, Belgium.)

Odontoglossum cordato-crispum. (*O. R.* 1898, 188.) G. Said to be a garden hybrid between the two species indicated by the name. It closely resembles *O. wilckeanum*. (J. Hye-Leysen, Ghent.)

Odontoglossum crispo-harryanum. (*O. R.* 1898, 170, 191.) G. A garden hybrid between the two species indicated in the name. (C. Vuylsteke, Ghent.)

Odontoglossum crispum Cypherii. (*O. R.* 1898, 155.) G. Flowers large and full with large dark maroon blotches and speckles. (J. Cypher.)

Odontoglossum crispum Leemanni. (*L.* t. 609.) G. A form with large flowers with large blotches of reddish purple. (L. Linden & Co., Brussels.)

Odontoglossum crispum mooreanum. (*L.* t. 624.) G. Sepals and petals bordered with yellow, central portions flushed with rose-purple; lip large, pure white, with one large and two small red-brown blotches and a yellow disk. (L. Linden & Co., Brussels.)

Odontoglossum grande Sanderæ. (*G. C.* 1898, xxiv., 377.) G. Sepals and petals lemon yellow marked with a deeper shade, destitute of brown markings; lip white with an irregular blotch of yellow. (F. Sander & Co.)

Odontoglossum hybridum ashworthianum. (*O. R.* 1898, 126.) G. Appears to be identical with *O. aspersum violaceum*. (E. Ashworth.)

Odontoglossum loochristiense. (*O. R.* 1898, 41, 107.) G. A garden hybrid between *O. crispum* and *O. triumphans.* (C. Vuylsteke, Ghent.)

Odontoglossum murrellianum Stevensii. (*O. R.* 1898, 110.) G. A variety with ivory white flowers blotched with purple. Supposed to be a natural hybrid between *O. gloriosum* and *O. Pescatorei.* (J. Stevens.)

Odontoglossum rochfordianum. (*O. R.* 1898, 127, 186.) G. Apparently a form of *O. andersonianum*, or a natural hybrid between *O. crispum* and *O. hunnewellianum.* (See *O. Adrianæ.*) It has broad segments much like *O. crispum leopardinum* in colour. (T. Rochford.)

Odontoglossum Rolfeæ. (*O. R.* 1898, 270.) G. A garden hybrid between *O. Pescatorei* and *O. harryanum.* (M. Vuylsteke, Loochristy, Ghent.)

Odontoglossum Ruckeri lilacina. (*O. R.* 1898, 155.) G. A distinct and pretty pink form with dark spotting. (L. Linden & Co., Brussels.)

Odontoglossum vigerianum. (*L.* t. 628.) G. A form of the variable natural hybrid *O. wilckeanum.* (L. Linden & Co., Brussels.)

Odontoglossum wilckeanum Lindeni. G. (*L.* t. 617; *O. R.* 1898, 155.) A finely-coloured form of this natural hybrid of which the parents are *O. crispum* and *O. luteo-purpureum.* (L. Linden & Co., Brussels.)

Œnothera Johnsoni, Parry. (*Gfl.* 1898, 430, f. 82.) Onagraceæ. H. A tall annual with large citron-yellow flowers. North - western America. (Dammann & Co., Naples.)

Oncidium albo-verrucosum. (*O. R.* 1898, 254.) Orchidaceæ. G. A supposed new species with bright yellow flowers, the sepals barred with brown, and the warted crest white. (Sir T. Lawrence.)

Oncidium gracillimum, Rolfe. (*K. B.* 1898, 197; *O. R.* 1898, 304.) G. A. new species, allied to *O. luteum.* Pseudobulbs ovoid, 3 in. long; leaves linear lanceolate 8 in. long; panicle large, much branched, 3 ft. long; flowers small, yellow with a few pale brown marks about the base of the segments. Peru. (F. Sander & Co.)

Oncidium macranthum Townsendi. (*G. C.* 1898, xxiv., 22.) S. Flowers exceptionally large and richly coloured. (E. Beckett.)

Oncidium thibaultianum. (*L.* t. 604.) S. Supposed to be a natural hybrid between *O. crispum* and *O. odoratum.* (M. E. Thibault, Nantes.)

***Opuntia papyracantha.** (*G. C.* 1898, xxiii., 339, f. 129.) Cactaceæ. S. Stem short, ovate, at first mamillose, afterwards wrinkled; spines, a short brush-like tuft with two or three sub-erect, flat, thin, paper-white appendages from 1 to 3 in. long; flowers not known. Argentina. (Kew.)

Opuntia xanthosoma elegans. (*Späth Cat.* 1898, 102, 152.) H. A form with soft rose-coloured flowers. Colorado. (Späth, Berlin.)

***Orchis monophylla,** Hook. f. (*B. M.* t. 7601.) Orchidaceæ. G. Tubers oblong; stem short, bearing one, rarely two, sub-erect oblong leaves 4 in. long, folded at the base, coloured green with large purple-brown spots. Peduncle 6 in. long, bearing a loose-flowered raceme of flowers which in size and marking resemble *O. maculata.* Burma. (Kew.)

Pachystoma thomsonianum punctulatum. (*R. H.* 1898, 504, t; *O. R.* 1898, 6.) Orchidaceæ. S. A form principally differing from the type in having the white sepals and petals minutely pointed with red. (M. Roland - Gosselin, Villefranche - sur - Mer, France.) [*Ancistrochilus thomsonianus*, Rolfe, var.]

Panax mastersianum. (*G. C.* 1898, xxiii., 242, f. 88.) Araliaceæ. S. Stem erect, bearing long, elegant, pinnate leaves 3 ft. long, with pinkish stalks, spotted with white; the rhachis forked; leaflets 10 in. long, pale green, flushed with pink. Solomon Islands. (F. Sander & Co.)

Pandanus Sanderi. (*G. C.* 1898, xxiii., 243, f. 94.) Pandanaceæ. S. Habit and general appearance of *P. Veitchi*, but variegated with cream yellow instead of white. Hab. ? (F. Sanders & Co.)

Paphiopedium Appletoniæ. (*O. R.* 1898, 112.) Orchidaceæ. S. A garden hybrid between *P. harrisianum* and *P. ciliolare.* (W. M. Appleton.)

Paphiopedium Mahleræ. (*O. R.* 1898, 271.) S. A garden hybrid between *P. rothschildianum* and *P. lawrenceanum.* (R. H. Measures.)

Paphiopedium Rowena. (*O. R.* 1898, 168.) S. A garden hybrid between *P. chamberlainianum* and *P. bellatulum.* (R. H. Measures.)

Paphiopedium Shipwayæ, Rolfe. (*O. R.* 1898, 338.) S. A supposed natural hybrid between *P. dayanum* and *P. Hookeræ* (Syn. *Cypripedium Shipwayæ*). Borneo. (Col. Shipway.)

Paphiopedium westoniense. (*O. R.* 1898, 112.) S. A garden hybrid between *P. appletonianum* and *P. barbatum Warneri*, very similar to *P. siamense.* (W. M. Appleton.)

Paphiopedium wiertzianum. (*O. R.* 1898, 335.) S. A garden hybrid brtween *P. rothschildianum* and *P. lawrenceanum.* (Linden, Brussels.)

Passiflora Im-Thurnii, M. T. Masters. (*G. C.* 1898, xxiii., 305, f. 114.) Passifloraceæ. S. A new species, near to *P. glandulosa.* Leaves broadly oblong, acute, leathery, glabrous above, setulose below. Flowers erect, 4 in. wide, with oblong glandular sepals coloured bright scarlet, the petals smaller, rose-coloured or almost white. Mr. Im Thurn calls it "the red and white Passionflower." Guiana.

Phaius Normani. (*L.* t. 618.) Orchidaceæ. S. A garden hybrid between *P. sanderianus* and *P. tuberculosus.* (N. C. Cookson.) [P. "Norman."]

Phalænopsis Schrœderæ. (*O. R.* 1898, 157.) Orchidaceæ. S. A hybrid between *P. leucorrhoda* and *P. intermedia Portei.* (Low & Co.)

Phalænopsis stuartiano-Mannii. (*O. R.* 1898, 157.) S. A garden hybrid between *P. Mannii* and *P. stuartiana.* (J. Veitch & Sons.)

Philodendron Martineti. (*G. C.* 1898, xxiii., 254.) Araceæ. S. Leaves large, sagittate, dark green above, purplish below. (De Smet-Duvivier, Ghent.)

***Philodendron triumphans.** (*G. C.* 1898, xxiii., 254.) S. Similar to *P. Carderi*, but a stronger grower, with leaves twice as large. (M. De Smet-Duvivier.)

Phlebodium Mayii. (*G. C.* 1898, xxiii., 332, f. 121.) Filices. S. A variety of *Polypodium aureum*, having undulated serrated fronds of a silvery metallic lustre and veins tinted with purple. (H. B. May.)

***Phlomis cashmiriana,** Royle. (*G. C.* 1898, xxiv., 424.) Labiatæ. H. A handsome species with whitish woolly leaves and pink flowers. Cashmir. (Max Leichtlin.)

***Phyllostachys fulva,** Mitford. (*G. C.* 1898, xxiv., 246, f. 68.) Gramineæ. H. This has the colouring of *Phyllostachys aurea* with the graceful habit of *P. Henonis* and *P. boryana.* Japan. (A. B. Mitford.)

Pilocereus marschalleckianus, Zeissold. (*M. K.* 1898, 34.) Cactaceæ. G. An unflowered plant described from an imported specimen. Mexico.

***Platycerium angolense,** Welw. (*G. C.* 1898, xxiii., 155, f.) Filices. S. A well marked species, quite distinct from *P. æthiopicum*, with which it has been confused. It differs in having a broad cuneate fertile frond 18 in. long 9 in. wide at the top, without either fork or horns and with a patch of fruit nearly as broad as the lamina. The under surface of the frond is covered with felt-like hairs. Angola. (Kew.)

Platyclinis rufa, Rolfe. (*K. B.* 1898, 192; *O. R.* 1898, 302.) Orchidaceæ. S. A new species, allied to *P. uncata*, but having reddish-brown flowers, a colour very unusual in the genus. Pseudobulbs cæspitose, egg-shaped ½ in. long; leaves linear acute, 10 in. long; scapes 6 in. long, many flowered. (Glasnevin.)

Pleurothallis rufa, Rolfe. (*K. B.* 1898, 192; *O. R.* 1898, 302.) Orchidaceæ. G. A new species allied to *P. vittata.* Stems 4 in. long; leaves fleshy 4 in. long, raceme short, fleshy; flowers small dull brown-red with a purple lip. Mexico.

***Podotheca chrysantha,** Benth. (*B. M.* t. 7625.) Compcsitæ. G. An erect annual, 12 in. high with linear scabrid leaves 2 in. long and numerous terminal heads 1 in. across, of small golden yellow flowers, suggesting *Pimelia.* Western Australia. (Kew.)

***Polypodium difforme macrophyllum.** (*G. C.* 1898, xxiii. 254.) Filices. S. A large bold fern with pinnate fronds 5 ft. long, the pinnæ 9 in. by 2 in., dentate, bright green. (M. Rigouts, Ghent.)

Polystachya usambarensis. (*N. B.* 1898, 250.) Orchidaceæ. S. Nearly related to *P. Kirkii*, Rolfe, but differs in its numerous leaves and always branched inflorescences. German East Africa. (Berlin B. G.)

Prunus Laurocerasus schipkaensis mischeana. (*Späth Cat.* No. 102, 111.) Rosaceæ. H. A form with spreading branches and shortly oval leaves. (Späth, Berlin.)

Prunus Laurocerasus schipkaensis zabeliana. (*Späth Cat.* No. 102, 110.) H. A form with willow-like long lanceolate leaves (Späth, Berlin.)

***Pteris cretica Summersii.** (*G. C.* 1898, xxiii., 370, f. 139) Filices. S. An improvement on the well known *P. cretica Wimsettii*. (H. B. May.)

Pteris Rochfordi. (*G. C.* 1898, xxiv., 241.) S. A robust crested form of *P. serrulata*. Garden origin. (T. Rochford.)

***Ptychosperma sanderiana,** Ridley. (*G. C.* 1898, xxiv., 330, 435, f. 126.) Palmæ. S. A new species; stem 10 to 15 ft. high, slender, nodes 3 in. apart; leaves 4 ft. long; pinnæ alternate, linear, 18 in. long, the apex tapering to a long point; panicle much branched, male flowers in pairs, females on a different panicle; fruit ½ in. long, ovoid, bright red; seed 5-grooved. Young plants very elegant. New Guinea. (F. Sander & Co.)

***Ptychosperma Warleti.** (*G. C.* 1898, xxiii., 242, f. 91.) S. A distinct palm, known only in a small state. Leaf-sheaths and stalks covered with coarse purplish hairs; pinnæ oblong, cuneate, erose at the margin, silvery beneath. Hab.? (F. Sander & Co.)

Purshia glandulosa, A. Gray. (*M. D. G.* 1898, 14.) Rosaceæ. H. A dwarf shrub resembling *P. tridentata*. Small yellowish-white flowers are numerous and have an odour of cinnamon. N. W. America.

Rhamnus purshiana intermedia Koehne. (*Späth Cat.* No. 102, 115.) Rhamnaceæ. H. Intermediate between the broad-leaved *R. purshiana* and the narrow-leaved *R. californica*. California. (Späth, Berlin.)

***Rhododendron rubiginosum,** Franch. (*B. M.* t. 7621.) Ericaceæ. H. This species much resembles *R. punctatum* from the mountains of North Carolina, &c., but differs in its much larger flowers. Yunnan. (J. Veitch & Sons.)

***Rhododendron yunnanense,** Franch. (*B. M.* t. 7614.) H. An erect-growing shrub with white flowers, 2 in. across, spotted with blood-red towards the base of the upper corolla-lobes. Yunnan. (J. Veitch & Sons.)

***Sambucus pubens,** var. **maxima,** Hesse. (*Gfl.* 1898, 592.) Caprifoliaceæ. H. This is apparently *S. canadensis*. (H. Hesse, Weener, Germany.)

***Sarcanthus hongkongensis,** Rolfe. (*K. B.* 1898, 198; *O. R.* 1898, 304.) Orchidaceæ. S. A new species, allied to *S. filiformis*. Stem 1 ft. high; leaves terete, recurved, 4 in. long; racemes axillary, 5 in. long, bearing numerous small flowers which are coloured pale lilac with the column and front of the lip bright purple. Hong Kong. (Kew.)

***Sedum Sempervivum,** Ledeb. (*G. C.* 1898, xxiii., 18, f. 7.) Crassulaceæ. H. A reintroduced species with the habit of a Sempervivum. Flowers reddish crimson. Asia Minor. (W. Siehe.)

Senecio candidans, DC. (*Gard.* 1898, liv., 252.) Compositæ. H. A species with large entire leathery leaves, the under side covered with a white tomentum. Flowers stated to be insignificant. Falkland Isles. (A. K. Bulley.)

Senecio hanburianus, Dinter. (*G. C.* 1898, xxiii., 354.) S. Described as a new species affined to *S. chordifolius*. Stem fleshy, branched, 5 in. long; leaves chordiform, about a foot long; flowers in loose cymes, pale yellow. ? South Africa. (T. Hanbury, La Mortola.)

Sievekingia reichenbachiana, Rolfe. (*B. M.* t. 7576.) Orchidaceæ. S. Habit of a small Stanhopea, having clustered, pear-shaped, ridged pseudo-

bulbs 1 in. long, each bearing an elliptic-lanceolate plicate prominently ribbed green leaf with mottled petiole. Flowers about 6 in a pendulous corymb borne on a peduncle 2 in. long, each 2 in. diam.; sepals ovate concave, pale yellow; petals narrower and together with the labellum, fringed with deep yellow hairs, the latter blotched with red. Ecuador. (Sir Trevor Lawrence.)

***Silene Fortunei,** Vis. (*G. C.* 1898, xxiv., 284.) Caryophyllaceæ. A perennial, much resembling a large form of the Nottingham Catch-fly, with laciniate pink petals. China. (Kew.)

Sobralia luteola, Rolfe. (*K. B.* 1898, 199; *O. R.* 1898, 304.) Orchidaceæ. S. A new species allied to *S. suaveolens.* Stems 3 ft. high; leaves oblong lanceolate, plicate, 6 in. long; flowers 3 in. across, light yellow with darker veins on the lip and a few traces of brown between the keels. Trop. America. (P. Ralli.)

Sobralia Wiganiæ. (*S. H.* 1898, 314.) S. A supposed natural hybrid of which *S. xantholeuca* is one of the parents. Flowers large, soft yellow shaded with rose. (Sir F. Wigan.)

Sophro-cattleya Chamberlainii. (*O. R.* 1898, 270.) Orchidaceæ. S. A garden hybrid between *Cattleya harrisoniana* and *Sophronitis grandiflora.* (Hon. J. Chamberlain.)

Spathiphyllum picturatum. (*G. C.* 1898, xxiii., 254.) Araceæ. S. A *Dieffenbachia*-like plant, with large, ovate, dark green leaves, spotted with yellow. (De Smet-Duvivier, Ghent.)

Stanhopea impressa, Rolfe. (*K. B.* 1898, 196; *O. R.* 1898, 303.) Orchidaceæ. S. A new species allied to *S. inodora.* Pseudobulbs 3 in. long; leaves elliptic oblong, 1 ft. long; scape 6 in. long, bearing 4 flowers with large ovate bracts elliptic oblong sepals and petals, 2 in. long, a 3-lobed lip 2 in. long, the colour being buff yellow lightly spotted with purple and blotched with orange on the lip. Western Andes. (Hon. W. Rothschild.)

***Stanhopea madouxiana,** Cogniaux. (*G. C.* 1898, xxiv., 134, f. 34.) S. A new species with ovoid pseudobulbs; leaves 20 to 30 in. long, 5 to 9 in. across; peduncle pendant, bearing one or two fragrant flowers 6 in. across, creamy white spotted with pink; lip tinged with dark purple; column with rather large wings. Colombia.

***Stanhopea rodigasiana.** (*G. C.* 1898, xxiv., 14, 32, f. 9. S. A new species with large flowers, 6 in. across, produced singly on pendulous scapes; sepals cream white spotted with rose and purple; column green spotted purple; lip dark purple with an ivory white blotch and numerous red spots on the mesochile. (Sir T. Lawrence.)

***Stanleya pinnatifida,** Nutt. (*Gfl.* 1898, 222, f. 67.) Cruciferæ. A hardy perennial, with glabrous glaucous leaves and many-flowered racemes of yellow flowers. Colorado. (W. Thompson, Ipswich.)

Staphylea elegans Hessei. (*M. D. G.* 1898, 36.) Sapindaceæ. H. Probably a hybrid between *S. colchica Coulombierii* and *S. pinnata.* (Hesse, Weener, Hanover.)

***Statice sinensis,** Girard. (*G. C.* 1898, xxiv., 284.) Plumbaginaceæ. A handsome species 3 ft. high with silvery calyces and yellow corollas. China. (Kew.)

***Tagetes lacera,** Brandegee. (*G. C.* 1898, xxiii., 355, f. 135.) Compositæ. G. A sub-shrubby, half-hardy perennial, with small clear orange chrome or yellow flowers. California. (Col. John Ross.)

Trichocentrum alatum, Rolfe. (*K. B.* 1898, 197; *O. R.* 1898, 304.) Orchidaceæ. S. A new species allied to *T. fuscum,* but having smaller flowers which are white, the base of the lip yellow, with red veins. Colombia. (Sir T. Lawrence.)

Ulmus Gaujardii. (*W. G.* 1898, 26.) Urticaceæ. H. "An elm of symmetrical upright growth and of great vigour." (Gaujard - Rome & fils, Chateauroux, France.)

***Veronica Dieffenbachii,** Benth. (*G. C.* 1898, xxiv., 155, f. 41.) Scrophulariaceæ. A greenhouse or half-hardy shrub, about 2 ft. high, bearing long spikes of blue flowers in the axils of the tough leathery leaves. Chatham Islands. (Lindsay.)

Veronica Lindsayi. (*G. C.* 1898, xxiv., 331, f. 97.) G. Supposed to be a hybrid between *V. amplexicaulis* and *V. pimeleoides.* (R. Lindsay.)

***Viola sulfurea,** Cariot. (*Jard.* 1898, 202.) Violaceæ. H. A form of the common violet (*V. odorata*, L. var.), with pale yellow flowers, (L. Chenault, Orleans.)

Vriesia Bloki. (*G. C.* 1898, xxiii., 254.) Bromeliaceæ. S. Apparently a synonym for *Tillandsia Regina.* (Ghent Exhibition.)

Vriesia Martelli. (*G. C.* 1898, xxiii., 254.) S. A near ally of *Tillandsia zebrina*, the leaves are narrower and whitish at the base; flowers bright red. (Ghent Exhibition.)

Vriesia mœnsiana. (*G. C.* 1898, xxiii., 254.) S. A near ally of *Tillandsia Regina.* Plant 5 ft. high; leaves 4 in. wide tapering to the apex, coloured cream yellow with green margin. (Ghent Exhibition.)

***Vriesia Vigeri.** (*R. H.* 1898, 395; *R. H. B.* 1898, 281, t.) S. A garden hybrid between *V. rodigasiana* and *V. Rex.* (M. Duval, Versailles.)

***Zephyranthes longipes,** Baker. (*K. B.* 1898, 225.) Amaryllidaceæ. G. A greenhouse bulb with linear leaves, thin flower-scapes 6 in. long, spathes 1 in. long, pedicels 4 in. long, and pale red flowers 3 in. long with lanceolate spreading segments. Stamens short, stigma deeply three-lobed. Montevideo. (Kew.)

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1899.

LIST of the STAFFS of the ROYAL GARDENS, Kew, and of Botanical Departments and Establishments at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Gardens, Kew :—

Director	Sir W. T. Thiselton-Dyer, K.C.M.G., C.I.E., F.R.S., LL.D., Ph.D., M.A., F.L.S.
Private Secretary	Stephen T. Dunn, B.A., F.L.S.
Principal Assistant (Office)	I. H. Burkill, M.A., F.L.S.
Assistant "	*John Aikman.
" "	*William Nicholls Winn.

Keeper of Herbarium and Library	*William Botting Hemsley, F.R.S., F.L.S.
Principal Assistant (Phanerogams)	Otto Stapf, Ph.D., A.L.S.
" " (Cryptogams)	George Massee, F.L.S.
Assistant (Herbarium)	Nicholas Edward Brown, A.L.S.
" "	*Robert Allen Rolfe, A.L.S.
" "	Charles Henry Wright, A.L.S.
" "	*Sidney Alfred Skan.
" "	———
" for India	H. H. W. Pearson, B.A.

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Honorary Keeper, Jodrell Laboratory - - - - - Dukinfield Henry Scott, F.R.S., M.A., Ph.D., F.L.S.

Keeper of Museums - - - John Reader Jackson, A.L.S.
Assistant (Museums) - - - John Masters Hillier.
Preparer - - - - - George Badderly.

Curator of the Gardens - - George Nicholson, F.L.S.
Assistant Curator - - - William Watson.
Foremen :—
Arboretum - - - - *William J. Bean.
Herbaceous Department - - *Walter Irving.
Greenhouse and Ornamental Department. Frank Garrett.
Temperate House - - - *William Dallimore.

Cambridge.—University Botanic Garden :—
Professor - - - Harry Marshall Ward, M.A., D.Sc., F.R.S., F.L.S.
Secretary to Botanic Garden Syndicate A. C. Seward, M.A., F.R.S.
Curator - - - *Richard Irwin Lynch, A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—
Keeper - - - Frederick W. Moore, A.L.S.

Trinity College Botanic Gardens :—
Professor - - - E. Perceval Wright, M.D., F.L.S., Sec. R.I.A.
Curator - - - *F. W. Burbidge, M.A., F.L.S.

Edinburgh.—Royal Botanic Garden :—
Regius Keeper - - Isaac Bayley Balfour, M.D., D.Sc., F.R.S., F.L.S.
Head Gardener - - A. D. Richardson.
Assistant Gardener - *R. L. Harrow.

Glasgow.—Botanic Gardens :—
University Professor - F. O. Bower, D.Sc., F.R.S., F L.S.
Curator - - - *Daniel Dewar.

Oxford.—University Botanic Garden :—
Professor - - - SydneyH.Vines,D.Sc., F.R.S., F.L.S.
Curator - - - *William Baker.

COLONIES.

Antigua.—Botanic Station :—

	Curator - - -	*W. N. Sands.

Barbados.—Dodd's Reformatory, Botanic Station :—

	Superintendent -	John R. Bovell, F.C.S., F.L.S.
	Assistant Superintendent.	C. E. Stoute.
	Lecturer in Agricultural Science.	†Albert Howard, B.A.

Bermuda.—Botanic Station :—

	Superintendent -	†G. A. Bishop.

British Central Africa.—Scientific Department :—

Zomba - -	Head of Department -	J. McClounie.
	Government Botanist	*John Mahon.

British Guiana.—Botanic Gardens :—

Georgetown -	Superintendent and Government Botanist.	*George S. Jenman, F.L.S.
	Head Gardener -	†John F. Waby.
	Agricultural Assistant	*Robert Ward.
	Promenade Garden :—	
	Head Gardener -	William Jackson
Berbice - -	Keeper - - -	Richard Hunt.

British Honduras.—Botanic Station :—

	Curator - - -	Eugene Campbell.

Canada.—

Ottawa - -	Dominion Botanist -	Prof. John Macoun, M.A., F.R.S.C., F.L.S.
	Assistant ,, -	Jas. M. Macoun.
	Director of Government Experimental Farms.	Prof. Wm. Saunders, F.R.S.C., F.L.S.
	Director's Assistant and Superintendent of Botanic Garden.	W. T. Macoun.
	Botanist and Entomologist.	James Fletcher, F.L.S.
Montreal - -	Director, University Botanic Garden.	Prof. D. P. Penhallow, B.Sc.

Cape Colony.—

	Government Botanist	Prof. MacOwan, F.L.S.

Ceylon.—Department of Royal Botanic Gardens :—

	Director - - -	†John C. Willis, M.A., F.L.S.
	Government Entomologist.	E. E. Green.
Peradeniya -	Curator - - -	*Hugh McMillan.
	Clerk - - -	J. Ferdinandus.
	Draughtsman - -	W. de Alwis.

Hakgala - -	Superintendent - -	*William Nock.
	Clerk and Foreman -	M. G. Perera.
Henaratgoda -	Conductor - -	S. de Silva, Arachchi.
Anurādhapura	,, - - -	D. F. de Silva.
Badulla - -	,, - - -	D. A. Guneratne.

Dominica.—Botanic Station :—

	Curator - - -	*Joseph Jones.
	Agricultural Instructor.	G. F. Branch.
	Agricultural School :—	
	Officer in Charge -	*D. Tannock.

East Africa Protectorate.—Botanic Station :—

Uganda	Curator - - -	†Alexander Whyte, M.A., F.L.S.

Falkland Islands.—Government House Garden :—

	Head Gardener - -	*Albert Linney.

Fiji.—Botanic Station :—

	Curator - - -	*Daniel Yeoward.

Gambia.—Botanic Station :—

	Curator - - -	———

Gold Coast.—Botanic Station :—

	Curator - - -	*William H. Johnson.
	Assistant Curator -	*T. W. Brown.

Grenada.—Botanic Garden :—

	Curator - - -	*Walter E. Broadway.

Hong Kong.—Botanic and Afforestation Department :—

	Superintendent - -	†Charles Ford, F.L.S.
	Assistant Superintendent	*W. J. Tutcher.

Jamaica.—Department of Public Gardens and Plantations :—

	Director - - -	†William Fawcett, B.Sc., F.L.S.
Hope Gardens -	Superintendent - -	*William Cradwick.
	Assistant Superintendent.	*Thomas J. Harris.
Castleton Garden	Superintendent -	*William J. Thompson.
Cinchona (Hill Garden).	,, -	*William Harris.
Kingston Parade Garden.	,, -	John Campbell.
King's House Garden.	Assistant Superintendent.	William R. Walker.
Bath - - -	Overseer - - -	A. H. Groves.
	Lecturer in Agricultural Science.	†W. R. Buttenshaw, B.Sc.

Lagos.—Botanic Station :—

	Curator - - -	———
	Assistant - - -	*F. G. R. Leigh.
	„ - - -	*T. B. Dawodu.

Malta.—Argotti Botanic Garden :—

	Director - -	Dr. Francesco Debono.

Mauritius.—Department of Forests and Botanic Gardens :—

Pamplemousses -	Director - - -	J. Vankeirsbilck.
	1st Assistant - -	Paul Koenig.
	2nd „ - - -	S. E. Pougnet.
	Overseer - - -	J. Powell.
Curepipe - -	Overseer - - -	F. Bijoux.
Reduit - -	„ - - -	W. A. Kennedy.

Montserrat.—Botanic Station :—

	Curator - - -	———
	Agricultural Instructor.	*A. J. Jordan.

Natal.—Botanic Gardens :—

Durban - -	Curator - - -	John Medley Wood, A.L.S.
	Head Gardener - -	*James Wylie.
Pietermaritzburg	Curator - - -	G. Mitchell.

New South Wales.—Botanic Gardens :—

Sydney - -	Director and Government Botanist.	J. H. Maiden, F.L.S.
	Superintendent -	George Harwood.
	Botanical Assistant -	E. Betche.

Technological Museum :—

	Curator - - -	R. T. Baker, F.L.S.

New Zealand :—

Wellington.—Colonial Botanic Garden :—

	Head Gardener - -	G. Gibb.
Dunedin - -	Superintendent - -	J. McBean.
Napier - -	„ - -	W. Barton.
Invercargill -	Head Gardener - -	Thomas Waugh.
Auckland - -	Ranger - - -	William Goldie.
Christchurch -	Head Gardener - -	*Ambrose Taylor.

Niger Coast Protectorate.—Botanic Garden :—

Old Calabar -	Curator - - -	*John H. Holland.
	Assistant Curator -	———

Perak (Taiping).—Government Gardens and Plantations :—

	Superintendent - -	*Robert Derry.

Queensland.—Botanic Department :—

Brisbane	Colonial Botanist	F. M. Bailey, F.L.S.
Botanic Gardens :—		
	Curator	*Philip MacMahon.
	Overseer	J. Tobin.
Acclimatisation Society's Gardens :—		
	Secretary and Manager	Edward Grimley.
	Overseer	James Mitchell.
Rockhampton	Superintendent	J. S. Edgar.

St. Kitts-Nevis.—Botanic Station :—

	Curator	*William Lunt.

St. Lucia.—Botanic Station :—

	Curator	*John Chisnall Moore.
	Agricultural Instructor.	George S. Hudson.

St. Vincent.—Botanic Station :—

	Curator	*Henry Powell.
	Agricultural Instructor.	*M. McNeill.

Sierra Leone.—Botanic Station :—

	Curator	*Walter Haydon.

South Australia.—Botanic Gardens :—

Adelaide	Director	Maurice Holtze, F.L.S.
Port Darwin	Curator	Nicholas Holtze.

Straits Settlements.—Gardens and Forest Department :—

Singapore	Director	†H. N. Ridley, M.A., F.L.S.
	Assistant Superintendent.	*Walter Fox.
Penang	Assistant Superintendent.	†Charles Curtis, F.L.S.

Tasmania.—Botanic Gardens :—

Hobart Town	Superintendent	F. Abbott.

Tobago.—Botanic Station :—

	Curator	*Henry Millen.
	Cacao Instructor	W. C. Caines.

Trinidad.—Royal Botanic Gardens :—

	Superintendent	†John H. Hart, F.L.S.
	Assistant ,,	*W. Leslie.

Victoria.—Botanic Gardens :—

Melbourne	Curator	W. R. Guilfoyle.
National Herbarium :—		
	Curator	J. G. Luehmann, F.L.S.

West Indies.—Imperial Department of Agriculture :—

Barbados	Commissioner	D. Morris, C.M.G., D.Sc., M.A., F.L.S.
	Travelling Superintendent.	G. W. Smith.
	Entomologist	†H. M. Lefroy, B.A.
	Honorary Consulting Chemist.	Prof. J. B. Harrison, M.A., F.I.C., F.C.S.
	" "	Prof. J. P. d'Albuquerque, M.A., F.I.C., F.C.S.

Western Australia.—Department of Agriculture :—

Perth	Botanist	Alexander Morrison.
	Consulting Botanist	F. Turner, F.L.S. (Sydney).

Zanzibar.—

	Director of Agriculture.	R. N. Lyne.

INDIA.

Botanical Survey.—Director, Major D. Prain, M.B., I.M.S., F.L.S., F.R.S.E.

Bengal, Assam, Burma ; the Andamans and Nicobars ; North-East Frontier Expeditions :—

Superintendent of the Royal Botanic Gardens, Calcutta	Major D. Prain, M.B., I.M.S., F.L.S., F.R.S.E.

Bombay, including Sind :—

Professor of Botany, College of Science, Poona	G. A. Gammie.

Madras: the State of Hyderabad and the State of Mysore :—

Government Botanist	†C. A. Barber, M.A., F.L.S.

North-Western Provinces and Oudh ; the Punjab ; the Central Provinces ; Central India ; Rajputana ; North-West Frontier Expeditions :—

Director of the Botanic Department, Northern India, Saharanpur, N.W.P.	†J. F. Duthie, B.A., F.L.S.

Bengal :—

Reporter on Economic Products to the Government of India, Indian Museum, Calcutta	†George Watt, M.B., C.M., C.I.E., F.L.S.

Bengal.—Department of Royal Botanic Gardens :—

Calcutta (Seebpore)	Superintendent -	Major D. Prain, M.B., I.M.S., F.L.S., F.R.S.E.
	Curator of Herbarium -	Lieutenant Gage, I.M.S.
	Curator of Garden -	*G. T. Lane.
	Assistant „ -	*Albert E. P. Griessen.
	Probationer -	———

Calcutta.—Agri-Horticultural Society of India :—

	Secretary - -	P. Lancaster.
Mungpoo -	Superintendent, Government Cinchona Plantations	Major D. Prain, M.B., I.M.S., F.L.S., F.R.S.E.
	Deputy „ -	*R. Pantling.
	1st Assistant -	*Joseph Parkes.
	2nd „ -	*Amos Hartless.
	3rd „ -	*Oliver T. Hemsley.
	4th „ -	———

Darjeeling.—Lloyd Botanic Garden :—

	Curator - - -	*George H. Cave.

Darbhangah.—Maharajah's Garden :—

	Superintendent -	Herbert Thorn.

Bombay.—

Poona - -	———	———
	Professor of Botany	G. A. Gammie.

Ghorpuri.—Botanic Garden :—

	Superintendent -	P. G. Kanitkar.

Bombay.—Municipal Garden :—

	Superintendent -	C. D. Mahaluxmivala.

Karachi.—Municipal Garden :—

	Superintendent -	———

Central Provinces.—

Nagpur - -	Superintendent of Public Gardens.	*J. Horne Stephen.

Madras.—Botanic Department :—

Ootacumund -	Government Botanist	†C. A. Barber, M.A., F.L.S.
	Director of Government Cinchona Plantations.	W. M. Standen.
	Curator of Gardens and Parks.	*Robert L. Proudlock.

Madras.—Agri-Horticultural Society :—

	Hon. Secretary -	- Dr. A. G. Bourne.
	Superintendent	- *B. Cavanagh.

Native States.—

Mysore (Bangalore)	Superintendent	- *J. Cameron, F.L.S.
Baroda - -	,,	- *G. H. Krumbiegel.
Gwalior - -	,,	- †C. Maries, F.L.S.
Morvi - - -	,,	- *Joseph Beck.
Travancore (Trivandrum)	,,	- ———
Udaipur - -	,,	- T. H. Storey.

North-West Provinces—

Agra (Taj Garden)	Superintendent	- F. J. Bullen.
Allahabad - -	,,	- *H. J. Davies.
Cawnpur - -	,,	- G. H. T. Mayer.
Kumaon (Ramghur)	,,	- *F. W. Seers.
Lucknow - -	,,	- *Matthew Ridley.
Saharanpur and Branch Garden, **Mussoorie.**	,,	- William Gollan.

Punjab.—

Lahore - -	Superintendent	- H. G. Hein.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX IV.—1899.

NOTE.

In the preface to the *Catalogue of the Library of the Royal Botanic Gardens*, which was issued as Volume III. of the *Additional Series* of the *Kew Bulletin*, it was stated that annual lists of future additions would be published in the *Bulletin.*

The present instalment contains the additions made to the Library by gift or purchase during the year 1898, with the exception of such current periodicals and annuals as continue sets already catalogued.

Like the Catalogue, the List is printed on one side of the page, to allow of its being cut up. It is probable that many persons and institutions will make the Kew Catalogue the basis of their own, and will use the lists of additions to supply printed slips for fresh titles.

3323—1375—7/99 Wt 92 D & S 29

CATALOGUE OF THE LIBRARY.

Additions received during 1898.

§ 1.—GENERAL.

Abercrombie, John. The Gardeners daily Assistant in the modern practice of English Gardening. London, 1786. 12mo.

Agardh, Jacob Georg. Species genera et ordines Algarum, etc. Vol. iii. Pars. 3. Lundae, 1898. 8vo.

Babington, Charles Cardale. The British Rubi. London, 1869. 12mo.

Baldacci, Antonio. Il mio settimo viaggio nel Montenegro. Roma, 1898. 8vo.

Ball, John. The Alpine Guide. The Western Alps. New edition by W. A. B. Coolidge. London, 1898. 8vo.

Bartholinus, Thomas. Dispensatorium Hafniense, jussu superiorum a medicis hafniensibus adornatum. Hafniae, 1658. sm. 4to.

Beal, William J. Report of the Botanical Department of the State Agricultural College [Michigan]. June, 1897. [Lansing, 1897]. 8vo.

Beauvisage, Georges E. C. Notice sur le R. P. Montrouzier. (Ann. Soc. Bot. Lyon, xxii.). Paris, 1898. 8vo.

Beckwith, Florence, & Mary E. Macauley (assisted by Joseph B. Fuller). Plants of Monroe County, New York, and adjacent territory (Proc. Rochester Acad. Sc. iii.). Rochester, 1896. 8vo.

Beroaldus, Phillipus, *the Elder*. See **Merula, G.**

Bischoff, Gottlieb Wilhelm. Organologisches, systematisches und Arten-Register zu den Tafeln des Handbuch's der botanischen Terminologie. Nürnberg, 1849. 4to.

Bishop, George A. A report on the diseases affecting the Lily in Bermuda, their cause, treatment, prevention. (Bermuda), 1898. 8vo.

[**Bloomfield, Edwin Newson.**] The natural history of Hastings and St. Leonards and the vicinity. Third supplementary list. St. Leonards-on-Sea, 1898. 8vo.

Boulger, George Simonds. Presidential address [to the South-Eastern Union of Scientific Societies], 1898. (Trans. South-East. Union Sc. Soc., 1898). 8vo.

[**Bourne, Alfred Gibbs.**] List of the plants of Southern India [from M. A. LAWSON'S herbarium. Madras, 1897]. fol.

Bower, Frederick Orpen. Address to the Botanical Section of the British Association for the Advancement of Science. Bristol, 1898. (London, 1898). 8vo.

Bretschneider, Emil. History of European botanical discoveries in China. London, 1898. 2 vols. 8vo.

Britten, James. Popular British Fungi. London (s.a.) 8vo.

Britton, Nathaniel Lord, & Addison Brown. An illustrated Flora of the Northern United States, Canada, and the British Possessions. Vol. iii. New York, 1898. 8vo.

Brotherus, Victor Ferdinand. Some new species of Australian Mosses. (Öfversigt af Finska Vet. Soc. Förh. lv.). 1898. 8vo.

Brown, Robert, *Farmer of Markle.* A treatise on agriculture and rural affairs. Edinburgh, 1811. 2 vols. 8vo.

Bruchmann, H. Ueber die Prothallien und die Keimpflanzen mehrerer europäischer Lycopodien. Gotha, 1898. 8vo.

Buchenau, Franz. *Luzula campestris* und verwandte Arten. (Oesterr. bot. Zeitschr., 1898). Wien, 1898. 8vo.

Buc'hoz, Pierre Joseph. Collection précieuse et enluminée des fleurs les plus belles et les plus curieuses, etc. Partie 1 et 2. Paris (1776). fol.

Bunbury, Frances Joanna. Life, letters, and journals of Sir Charles J. F. Bunbury, Bart., edited by his wife F. J. B. (s. l. e. a.) 3 vols. 8vo.

Butz, George C. The cultivation of American Ginseng in Pennsylvania. (Commonwealth of Pennsylvania, Dep. Agric. Bull. 27). 1897. 8vo.

[**Cambridge.**] Report (Annual) of the Botanic Garden Syndicate. May 31, 1898. Cambridge, 1898. fol.

Camerarius, Joachim I. F. Icones accurate nunc primum delineatæ stirpium, quarum descriptiones tam in Horto quam in Sylvia Hercynia suis locis habentur. Francofurti ad Mœnum, 1588. sm. 4to.

Carrington, Benjamin. British Hepaticæ. [Part 4]. London, s.a. 8vo.

Cato, M. See **Merula, G.**

Cause, D. H. De koninglycke Hovenier aanwyzende de middelen om Boomen, etc. Amsterdam (1676). fol.

Ceylon. Handbook and Directory, 1885–86, edited by A. M. & J. FERGUSON. Colombo, 1886? 8vo.

Cobbett, William. The English Gardener. London, 1829. 8vo.

Coe, Charles C. Nature versus natural selection. London, 1895. 8vo.

Coincy, Auguste de. Ecloga tertia plantarum hispanicarum. Paris, 1897. 4to.

—— Ecloga quarta plantarum hispanicarum. Paris, 1899 [1898]. 4to.

Coleman, W. S. Our woodlands, heaths, and hedges. London, 1859. 8vo.

Colgan, N. See **Moore, D.** Cybele Hibernica. Ed. II.

Columella, L. J. M. See **Merula, G.**

Commelyn, Jan. Nederlantze Hesperides, dat is, oeffening en gebruik van de Limoen en Oranje-Boomen. Amsterdam, 1676. fol.

Contributions from the Shaw School of Botany. 10. SCHRENK, H. VON. The trees of St. Louis as influenced by the tornado of 1896. 11. SCHRENK, H. VON. On the mode of dissemination of *Usnea barbata*. [St. Louis, 1898.]

Coolidge, W. A. B. See **Ball, J.**

Curaçao. Tweede jaarlijksch Verslag van het Geschied-, Taal-, Land- en Volkenkundig Genootschap. Amsterdam, 1898. 8vo.

[**Curtis, William.**] A catalogue of the Plants growing wild in the environs of London. London, 1774. 8vo.

Darbishire, Otto Vernon. Ueber *Bangia pumila*, Aresch. (Wissenschaft. Meeresuntersuchung. Neue Folge, iii.) [Kiel], 1898. 4to.

De Vries, Hugo. L'unité dans la variation. Considérations sur l'hérédité. (Revue de l'Université de Bruxelles, iii.) Bruxelles, 1898. 8vo.

De Wildeman, Em., & Théophile Durand. Prodrome de la Flore Belge, 1–7. Bruxelles, 1897–98. 8vo.

De Wildeman, Ém. & Théophile Durand. Illustrations de la flore du Congo. (Annales du Musée du Congo. Série I. Tome i. Fasc. 1–2.) Bruxelles, 1898. 4to.

Diels, Ludwig. Die Flora von China. (Naturwissensch. Wochenschr. xiii.) 1898. fol.

Dixon, Henry H. & J. Joly. On some minute organisms found in the surface-water of Dublin and Killiney Bays. (Scientific Proc. Roy. Dubl. Soc. viii. (N. S.) (Dublin, 1898). 8vo.

Draper, Walter. Le Jardinage en Égypte. Traduit par E. M. Bensilum. Le Caire, 1898. 8vo.

Drayton, Edward. The Grenada Handbook, Directory and Almanac for the year 1898. London, 1898. 8vo.

Druce, George Claridge. Notes on Mr. Britten's review of "The Flora of Berkshire," etc. London, 1898. 8vo.

Durand, Théophile, & Hans Schinz. Conspectus Floræ Africæ. Vol v. and Vol. i, 2me partie. Bruxelles, 1895 and 1898. 8vo.

Durand Théophile. See **De Wildeman, Ém.**

Engler, Adolf, & Oscar Drude. Die Vegetation der Erde. ii. Grundzüge der Pflanzenverbreitung in den Karpathen, von F. PAX. Band i. Leipzig, 1898. 8vo.

English forests and forest trees. London, 1853. 8vo.

Estienne (*latinized* **Stephanus), Charles.** Seminarium sive plantarium earum arborum, quæ post ortos conseri solent etc. Lugduni, 1537. 8vo.

—— Arbustum. Fonticulus. Spinetum. Parisiis, 1538. 8vo.

—— De re hortensi libellus, etc. Lugduni, 1539. 8vo. (This differs from the Paris edition.)

Farlow, William Gilson. The conception of Species as affected by recent investigations of Fungi. (Address to Amer. Assoc. Adv. Sc.) Boston, 1898. 8vo.

Farrer, W. The making and improvement of Wheats for Australian conditions. (Dep. Agric. Sydney, Misc. Publication, 206.) Sydney, 1898. 8vo.

Fedtschenko, Boris (Fedchenko). Poyezdka b zapadnsiĭ Tyan-shan dlya izucheniya dednikov Talassakago Alatau. (Izvyestiĭ, iv.) S.-Peterburg, 1898. 8vo. (Predvaritelnuiĭ otchet) *i.e.*, Preliminary Report.

Feilden, Henry Wemyss. The flowering plants of Novaya Zemlya, etc. (Journ. Bot., 1898.) London [1898]. 8vo.

Ferguson, A. M., & J. See **Ceylon.**

Fischer, Eduard. Beiträge zur Kryptogamenflora der Schweiz. Band i. Heft 1.—Entwicklungsgeschichtliche Untersuchungen über Rostpilze. Bern, 1898. 8vo.

Fliche, Paul. Note sur la flore des lignites des tufs et des tourbes quaternaires ou actuels du Nord-est de la France. (Bull. Soc. Géol. Fr. III. xxv.) Paris, 1897. 8vo.

—— Les naturalisations forestières en France et la paléontologie. Besançon, 1898. 8vo.

—— Note sur les bois fossiles de Mételin. (Ann. des Mines, 1898.) Paris, 1898. 8vo.

—— Note sur les tufs du Brabant (Vosges) et les variations du noisetier commun. Paris [1898 ?] 8vo.

Florist. The Complete Florist, or the Lady and Gentleman's Recreation in the Flower Garden, etc. London [1730 ?] 8vo.

Fuchs, Leonhard. Den nieuwen herbarius, dat is, dboeck van den cruyden int welcke bescreven is niet alleen die gantse historie van de cruyden, maer oock gefigureert ende geconterfeyt. Basel, Isingrin, 1543. fol.

Fuller, Joseph B. See **Beckwith, F.**

Gallardo, Angel. Algunos casos de teratologíca vegetal. Fasciación, proliferación y sinantia. (An. Mus. Nac. Buenos Aires, VI.) Buenos Aires, 1898. 8vo.

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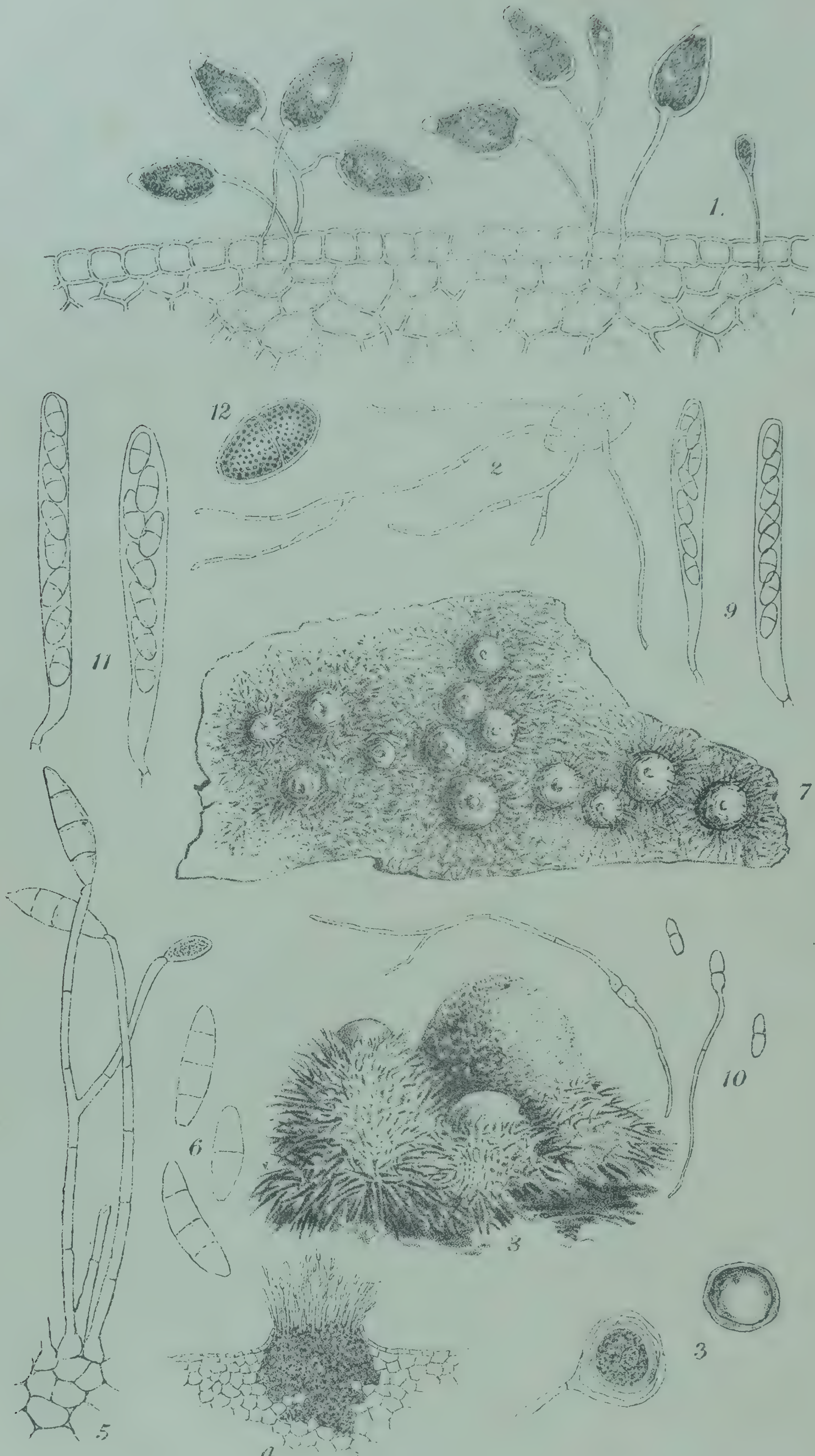

Cacao disease.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 145-146.] JANUARY and FEBRUARY. [1899.

DCXXXV.—CACAO DISEASE IN TRINIDAD.

(*With Plate.*)

The cultivation of cacao is an important industry in many British colonies. This is especially the case in Trinidad, where the crop has recently suffered (as is sooner or later the fate of all cultural industries) from disease.

The facts are detailed in the following correspondence. The preliminary steps in their investigation reflect great credit on the Superintendent of the Royal Botanic Gardens. Their complete discussion required the technical assistance of Kew.

GOVERNOR OF TRINIDAD TO ROYAL GARDENS, KEW.

Government House, Trinidad,
December 20, 1898.

SIR,

THE Superintendent of the Trinidad Botanic Gardens will forward to your department by the present mail specimens of cacao pods attacked by a fungus which is reported to be doing serious damage to the cacao in certain districts of this island, and which, unless checked, may, it is feared, prove disastrous to that industry.

It is hardly necessary for me to assure you that this Government will be very thankful for such early assistance and advice in the matter as it may be in your power to afford.

I have, etc.,
(Signed) HUBERT E. H. JERNINGHAM,
Governor.

Sir W. T. Thiselton-Dyer,
Royal Gardens, Kew.

3242—1375—7/99 Wt 92 D & S

SUPERINTENDENT, ROYAL BOTANIC GARDENS, TRINIDAD, TO ROYAL GARDENS, KEW.

Botanical Department, Trinidad,
December 17, 1898.

SIR,

I FORWARD you by this mail a set of specimens of a disease affecting growing cacao pods, which is said in some districts to cause a loss of as much as 50 per cent. of the crop.

2. The question has been up some time, and I have had several sets of specimens for examination. Up to December 8, however, I had never been able to reproduce the disease in healthy pods by inoculation.

3. On receipt of diseased pods from Mr. T. H. Warner, Warden of Tacarigua, a Government officer of high standing, I commenced a microscopic examination and found a fungus permeating the specimens, causing in one instance the upper half of the pod to decay, and in two instances the lower part of the pod. Placed in a damp chamber, the whole pod rapidly became covered with the fungus, and in an ordinary atmosphere the same took place less rapidly.

4. With a view of ascertaining whether the fungus was parasitic or saprophytic, I made a microscopic examination and procured spores, which I placed in a small slit in the skin of healthy pods. This resulted in the rotting away of the infected pods in seven days' time and the reproduction of an abundant crop of the same spores on all sides of the pods. One hundred per cent. of artificially-infected pods rotted away.

5. I send some portions preserved in formalin solution, some parts dried and some fresh-packed in dry charcoal. If more specimens are required I shall be glad to take instructions as to preparation for the journey.

6. It appears to me that it would be well to suggest the application of "Bordeaux Mixture," and the picking and burning of all infected pods, dressings to take place after the collection of the rotten pods.

7. The disease appears to me to be essentially an outside disease, and obtains entrance through wounds or punctures from any cause. It may be possible that insect-punctures would enable the spores to gain access to the pods. It is certain that a cut or incision will.

Yours faithfully,
(Signed) J. H. HART.

The Director,
Royal Gardens, Kew.

SUPERINTENDENT, ROYAL BOTANIC GARDENS, TRINIDAD, TO ROYAL GARDENS, KEW.

Botanical Department, Trinidad,
January 5, 1899.

SIR,

WITH regard to cacao pod disease, I now submit further information collected since last mail.

2. I visited the infected estate, and found the disease rampant in low hollows and damp places, especially where heaps of broken shells had been allowed to rot upon the ground. On the ridges

and in dry places little disease appears, except where pods have been opened under the trees and the shells have been allowed to lie and rot.

3. After the pods are destroyed by the fungus—which has lance-shaped spores—it is soon taken possession of by numerous saprophytic fungi, which practically eradicate all trace of the original destroyer.

4. If the fungus is new, I suggest it should be named after Mr. Bain, who first called attention to it.

5. Mr. Bain reports that, by clearing out all diseased pods and destroying at once all shells of the opened, he has checked the disease on his estate.

6. I have again reproduced the disease in numerous healthy pods.

7. So far as can be judged by Mr. Carruthers's report, the cacao in Ceylon has the pods affected by a similar organism. The description of the trees and the age given show that cacao in Ceylon has a much lower vitality than in Trinidad, and consequently is more liable to disease.

8. The pod-disease is apparently no new thing. Planters say it has been noted for years, but not so bad as this year.

Yours faithfully,
(Signed) J. H. HART.

The Director,
Royal Gardens, Kew.

The living material forwarded by Mr. Hart reached Kew in excellent condition for examination, exhibiting every phase of the disease, and growing vigorously when placed under favourable conditions. Ample spirit material was also sent.

Microscopic examination revealed the presence of two distinct fungous parasites; one being the well known *Phytophthora omnivora*, De Bary, a species closely allied to *Phytophthora infestans*, De Bary, the cause of the potato disease; the other a *Nectria*, which proves to be new to science, and will be known as *Nectria Bainii*, the name suggested by Mr. Hart, in compliment to Mr. Bain, who first called attention to the disease.

The *Phytophthora* was present on all the pods sent, and may be considered as the cause of the present epidemic in Trinidad. The same or a closely allied species appears to be the cause of the cacao-pod disease in Ceylon.

The *Nectria* appeared on two pods, and this again possesses many points in common with the *Nectria*, which has caused such destruction to cacao trees in Ceylon by attacking the bark of the trunk and branches, as described by Mr. J. B. Carruthers. At present no mention is made of other than the pod-disease in Trinidad, but the fact of a parasitic *Nectria* being present necessitates the prompt execution of measures calculated to prevent the parasite from extending its ravages.

PHYTOPHTHORA OMNIVORA, De Bary.

This fungus, as indicated by its specific name, is not fastidious in its choice of a victim, and has been recorded as attacking various species of plants belonging to the following genera : *Acer*, *Alonsoa*, *Abies*, *Cleome*, *Clarkia*, *Cereus*, *Epilobium*, *Fagopyrum*, *Fagus*, *Gilia*, *Larix*, *Lepidium*, *Melocactus*, *Œnothera*, *Picea*, *Pinus*, *Solanum*, *Sempervivum*, *Salpiglossis*.

If the fungus is confined to the fruit of the cacao tree it is obvious that infection each season must necessarily be derived from some outside source, the spores for this purpose being in all probability often produced on diseased fruit or "shells" lying on the ground under the trees; nevertheless being able to live on such a variety of host-plants, infection of a plantation for the first time might very possibly be attributed to wind-borne spores produced on some other kind of host-plant. This may appear to be poor consolation. However it is well to be in possession of all known facts and possibilities in connection with the subject under consideration. The life-history cf the fungus is well known, having been carefully studied by De Bary, Hartig, and others.

The conidial form of fruit appears as a very delicate white mould on the surface of the part attacked. The conidia or reproductive bodies are ovate or egg-shaped, being attached at the broad end to a very slender stalk, which shrivels and liberates the conidium when mature. This condition of the fungus flourishes for a few weeks during the period of active growth of the host-plant; and as the conidia are produced in immense numbers and in quick succession, and are dispersed by wind, insects, or rain, being washed from diseased part of a tree to healthy parts, it can readily be understood why the pest spreads so quickly when once established. Conidia that happen to alight on young pods germinate at once, penetrate the tissues, and quickly produce a new centre of disease which furnishes more conidia in due time.

During the period occupied in the production of the external form of fruit described above, the mycelium of the fungus spreads rapidly in the substance of the pod and gives origin to a second form of fruit imbedded in the tissue of the pod. These reproductive bodies, known as resting spores remain for some months in a passive condition, and are eventually liberated by the decay of the pod : when they germinate, the bodies produced on germination being conveyed by wind to the young pods, germinate in their turn, enter the tissue, and in a few days' time produce the conidial form of the fungus on the surface of the pod.

Preventive Measures.—If it is ascertained that the fungus is not harboured by other plants growing in the neighbourhood of the plantation, but is confined to the cacao trees, then prevention becomes an easy matter. It depends on having every diseased fruit collected and burned ; for the only possible cause of infection in the first instance must arise from the germination of resting-spores developed in diseased pods, and so long as these are allowed to remain on the ground under the trees the disease will continue to spread. But the fungus may also attack other wild plants, and thus become firmly established and defy extermination.

The following measures should be taken to combat the disease :—

i. Spray with Bordeaux mixture, commencing when the pods are quite young, and continue at intervals of ten days.

A dilute solution should first be used until its effect on the fruit and foliage is ascertained. A small quantity of dried blood should be dissolved and added to the mixture ; its adhesive property is much increased, and fewer sprayings are required.

ii. Remove all diseased fruit from the tree if practicable, otherwise a continuous supply of conidia will be furnished until the fruit decays. Do not allow diseased fruit or "shells" to remain on the ground. All such should be collected and burned.

iii. Endeavour to ascertain, by careful examination, whether the fungus may not be also parasitic on other hosts ; it very frequently attacks seedlings, and would be recognised by the wilting of the attacked parts, and by the delicate white mould-like conidial form of reproduction.

NECTRIA BAINII, Massee.

This parasite causes semicircular dark blotches to appear on the pods, the diseased portion becoming soft and watery. At a later stage the blotches become covered with a loosely interwoven layer of yellowish-rust coloured or orange mycelium which is studded over with the minute bright red perithecia or fruiting organs of the fungus.

The perithecia are often preceded by a small snow-white *Fusarium*-like mould, which, from analogy with other species, may be a conidial condition of the *Nectria*. But the connection has not however been proved by cultures.

This parasite may possibly be quite rare ; but great care should be taken to arrest any attempt on the part of the fungus to attack the trunk of the cacao tree, for as already stated the destructive canker disease of the cacao in Ceylon is caused by a *Nectria*.

Nectria Bainii, Massee. *Perithecia* gregaria, mycelio maculiformi flavo-ferrugineo vel aurantiaco insidentia, sphæroidea, rubra, lanosa, demum supra calvescentia, 300–350 μ diam. *Asci* cylindraceo-clavati, breviter pedicellati, octospori, 80–90 × 7–9 μ. *Sporæ* distichæ, oblongo-ellipticæ, utrinque subacutæ, 1–septatæ, 10–12 × 5 μ, hyalinæ. GEO. MASSEE.

Fig. 1. *Phytophthora omnivora* ; Section of a portion of a cacao fruit, showing the conidial form of reproduction of the fungus on the surface, × 300.

2. A conidium of the same germinating, × 300.

3. Oospores of the same produced in the diseased tissue of a cacao fruit, × 400.

4. Pustule of *Nectria* bursting through the skin of a cacao fruit, and producing the conidial form of reproduction, × 40.

5. Portion of the conidial form of fruit, × 400.

6. Free conidia of same, × 400.

7. *Nectria Bainii*, Surface view of sporophores seated on a byssoid stroma, × 50.

8. Three perithecia in different stages of development, showing the byssoid covering of the exterior.

9. Asci, × 400.

10. Germinating spores of same, × 400.

11. Asci of a saprophytic species of *Nectria* appearing after the fruit is dead, × 400.

12. Spore of same showing the granular protoplasm; the epispore is smooth, × 1000.

DCXXXVI.—COCCID PESTS ON SUGAR CANE.

In the Kew Report for 1877, p. 39, reference is made to Coccids or scale insects, that had ravaged the cane fields of Bourbon and Mauritius, known locally as "le pou à poche blanche." Mr. Robert McLachlan, F.R.S., pointed out that this was a collective name, and probably included several species. The most prominent at the time was believed to be *Icerya sacchari*, Guérin-Méneville.

Somewhat similar insects also made their appearance on sugar cane in Queensland. One of these was afterwards identified as *Icerya Purchasi*, Maskell, fully described (with a coloured plate) in *Kew Bulletin* (1889, pp. 191–216).

In 1887, correspondence relating to the attacks of Coccids on forest trees in the island of Rodrigues was referred to Kew with specimens by the Secretary of State for the Colonies. Mr. McLachlan had little doubt that these insects were identical with those that "had long been known to occasion great damage in the neighbouring islands of Bourbon and Mauritius."

The following further information has been received respecting the Mauritius insects :—

MR. T. D. A. COCKERELL TO ROYAL GARDENS, KEW.

Agricultural Experiment Station,
Mesilla Park, New Mexico,
July 15, 1898.

DEAR SIR,

THE note on the moth-borers of the sugar cane in *Kew Bulletin*, 1898, p. 102, suggests that you may like to have the latest information on the Coccid pest of sugar-canes in Mauritius, if this information has not already reached you from elsewhere.

In 1864, M. E. Icery, in a memoir presented to the Chamber of Agriculture in Mauritius, gave an account of a Coccid which had done much injury to sugar-cane in that island. He called it "le pou à poche blanche."

Guérin-Méneville, in the *Rev. et Mag. Zool.*, 1868, discussed the sugar-cane Coccids of Mauritius and Réunion, and concluded that under the name "pou à poche blanche" had been confused three Coccids, which he called *Coccus sacchari*, *Gasteralphes Iceryi*, and *Lecanium Guerinii*, and also an aleurodid, *Aleurodes Bergii*. The first species was described and named by Guérin-Méneville himself; the other three were described by Signoret.

Gasteralphes Iceryi is now known as *Pulvinaria gasteralpha* (Icery); and *Coccus sacchari* is *Icerya seychellarum* (Westwood). Of these two, the former is still imperfectly known; but the latter is well known, and has been found in Madeira, Seychelles, Rodrigues, Mauritius, Hong Kong, Canton, Amoy, and Formosa. It occurs in China on rose and *Podocarpus*.

Without citing the rather copious bibliography, it will suffice to say that since the early seventies it has been held that the real culprit in Mauritius was the *Icerya sacchari*.

The late Mr. W. M. Maskell, in Trans. New Zealand Institute for 1896, p. 320, records that he received some of the sugar-cane coccid from Mauritius, through Mr. Lounsbury of Cape Town; and it was not an *Icerya*, but to his surprise it turned out to be *Dactylopius sacchari*, Ckll., which I had described from Trinidad (B. W. I.) in 1895. It was understood that it occurred with *Icerya sacchari*, "and the two species are confounded by the residents under the name of '*pou blanc*'"; Mr. Maskell still supposed that the latter was the principal offender.

But in a letter dated August 29, 1897, Mr. Maskell wrote me:— "Note in my paper of 1896 your *Dactylopius sacchari* from Mauritius. In a letter just received from that island, I am told that *Icerya sacchari* never does any harm whatsoever to sugar-cane, and that it is, in fact, never seen on that plant, even accidentally; therefore we have all been wrong about it for the last five and twenty years."

There can be little doubt that the *Dactylopius sacchari* is of eastern origin, though it happened to be first described from Trinidad.

Yours very truly,

(Signed) THEO. D. A. COCKERELL.

DCXXXVII.—MOSS FLORA OF THE ROYAL GARDENS, KEW.

In the *Kew Bulletin* for 1897 (p. 115) it was pointed out that of the half a square mile occupied by the Royal Gardens and some adjacent pieces of Royal property, above a third or "some hundred acres is little disturbed by any kind of cultivation, and it has certainly remained so for at least a century and a half. Some portions may never possibly have been subjected to cultivation at all. It is not surprising, therefore, that in the background of horticultural treatment there still subsists a wild fauna and flora of no inconsiderable dimensions. These, as opportunity offers, it is proposed to work out and catalogue from time to time."

The flowering plants were catalogued by Mr. Nicholson in the *Journal of Botany* for 1875; the fungi by Mr. Massee in the *Kew Bulletin* (*l.c.*, pp. 115–167). Kew is indebted to Mr. Ernest S. Salmon for a further instalment towards a complete enumeration of the flora in the list of mosses now published, which, with the introductory remarks below, is from his pen.

One hundred and six species of mosses and seven varieties were collected in the Royal Botanic Gardens, Kew, in 1898, unless otherwise stated. The strip of ground between the Gardens and the Thames has been added so as to make the area the same as that worked by Mr. George Nicholson for his "Wild Flora of Kew Gardens."

To anyone unacquainted with the wild parts of Kew Gardens it may seem incautious to consider as indigenous any of the mosses now found growing within these limits. But it is only with regard to those of a very few places, such as the Rockery, for which some of the stones were originally brought from Cheddar and Bath and may possibly have brought mosses attached to them, that a probability of introduction exists. In many places in the Gardens, *e.g.*, the boundary ditch and bank running the length of the Old Deer Park, the Queen's Cottage Grounds, parts of the Palace grounds, etc., the nature of the surface makes it quite safe to consider the species growing there as indigenous. The inclusion of the river-bank in the area has led to the addition of several interesting aquatic mosses, and, without doubt, all these are quite wild.

A few common species are absent from the list, while, on the other hand, several rare species occur in it.

Amblystegium Kochii, which hitherto has only been known as occurring in Britain in a single locality in Sussex, where it was found by Mitten, occurs at Kew in one or two places by the Thames, together with *A. varium*, *Fissidens crassipes*, *Physcomitrium pyriforme*, *Leskea polycarpa*, *Cinclidotus fontinaloides*, etc.

Of other interesting species, *Mnium cuspidatum*, *M. stellare*, *Bryum Donii*, *Tortula intermedia*, *Trichostomum tortuosum*, *Encalypta streptocarpa*, *Barbula lurida*, and *Neckera crispa* have been noticed only in or about the Rockery; and, for reasons mentioned above, their nativity must remain doubtful.

On the other hand, the following species (amongst others) are certainly wild:—*Polytrichum formosum*, *Plagiothecium borrerianum*, *Pleuridium axillare*, *P. subulatum*, *P. alternifolium*, *Funaria fascicularis*, *Tortula marginata*, *Fissidens pusillus*, *F. exilis*, *F. incurvus*, *F. viridulus*, *Leptobryum pyriforme*, *Acaulon muticum* and var. *mediterraneum*, *Bartramia pomiformis*, *Ephemerum serratum*, *Aulacomnium androgynum*, *Dicranum Bonjeani*, *Thamnium alopecurum*, *Eurhynchium piliferum*, and *E. megapolitanum*.

I have to thank Mr. George Massee for a list, accompanied by specimens, of 20 Kew mosses, collected by him in previous years. Five of them, which I have not been able to refind, are included in the list on his authority. In most cases the habitats of these species have become changed through improvements, and the species are very probably now lost.

To Mr. George Nicholson I am greatly indebted, not only for furnishing me with a list of about 40 mosses already recorded for Kew Gardens, but also for showing me the original stations for many of these, and for helping me to search for new species.

The nomenclature followed is that of Dixon's "Students' Handbook of British Mosses."

I have placed specimens of the more interesting species in the Kew Herbarium.

Explanation of the abbreviations used :—

A. Arboretum.
B. Botanic Garden.
P. Palace and Herbarium Grounds.
Q. Queen's Cottage Grounds.
R. Rockery.

Catharinea undulata, *Web. et Mohr.*
Common, and fruiting freely in all the drier places, as in the Rockery, where it forms luxuriant patches.

Polytrichum aloides, *Hedw.*
In several places along the boundary ditch by the Old Deer Park, between the Lion Gate and Queen's Cottage ; fruit not seen.

P. piliferum, *Schreb.*
Not uncommon in dry places ; abundant along the boundary ditch with the last species ; sandy banks near the lake, etc. ; occasionally fruiting.

P. juniperinum, *Willd.*
Abundant in dry places throughout the Gardens ; frequently fruiting.

P. formosum, *Hedw.*
Fairly common in sandy places, in the open, and also under trees ; fruiting in the Arboretum.

A curious *Polytrichum*, intermediate in some characters between *P. formosum* and *P. gracile*, Dicks, occurs in a few places along the boundary ditch by the Old Deer Park. In this form the leaf-base, instead of being composed of cells about 6–10 times as long as broad, as is usual in *P. formosum* (see Dixon, *Student's Handbook*, p. 46), shows an areolation similar to that of *P. gracile*, the cells being comparatively wide, and only 3–4 times as long as broad. Occasionally, also, the plant shows a further approach towards *gracile*, as some of the leaves have a rather wide limb in the upper part of the leaf, and frequently the lamellæ are only about 40 in number.

Both Mr. W. E. Nicholson and Mr. Dixon at first referred the plant to *P. gracile*, Dicks, relying especially on the short wide basal areolation. I have just heard from Mr. Dixon, however, that Mr. Bagnall, to whom specimens of the Kew plant were submitted, thinks that it should be referred to *P. formosum*, and that Mr. Dixon himself is now inclined to agree with the view that it is nearer that species than *P. gracile*, although still thinking that there is an approach to the form of areolation of the latter. Only barren plants of this form, which is certainly native, have so far been found.

Pleuridium axillare, *Lindb.* (c. fr.)
In the Bamboo Garden and near the Pumping Station. Occurs commonly in pots in the Glass-houses, where the leaf cells become very lax.

P. subulatum, *Rabenh.* (c. fr.).
Not uncommon on sandy ground; about the lake and on the islands; Bamboo Garden; Tulip Tree Avenue; P.

P. alternifolium, *Rabenh.* (c. fr.).
A., bare places near the lake; Rose Garden, on earth adhering to stumps.

Ceratodon purpureus, *Brid.*
Abundant and common in fruit throughout the area.

Dicranella heteromalla, *Schimp.*
Abundant and fruiting in all the drier places.

D. cerviculata, *Schimp.* (c. fr.).
Kew Gardens (unlocalised, Massee, 1897).

D. varia, *Schimp.*
On mud thrown up from a ditch, near Pumping Station, in fruit (Massee, 1897).

Dicranum Bonjeani, *De Not.*
Q. Abundant in one place, barren; A. pinetum; B. small form, growing on a bank, with a very different habit from the type, is referred to this species by Mr. Dixon with the following note:— "I think your *Dicranum* must be *Bonjeani* from the general 'tone' and areolation and thin nerve without ridges at the back, as well as the undulation, which is indeed very faint (the leaves being so short), but is distinguishable on most leaves, I think, or many, at least. It is a very short-leaved form."

D. scoparium, *Hedw.*
Common in dry places under trees, amongst grass, etc.; barren.

Fissidens exilis, *Hedw.* (c. fr.).
A., on the third island (from culvert end) in the lake; Q., in an open space.

F. viridulus, *Wahlenb.* (c. fr.).
Q., on a loose stone; boundary ditch near the river; A., on stones embedded in the bank near the other (Lion Gate) end of the boundary ditch.

Var. **Lylei**, *Wils.*
Some of the plants from the first locality given above have leaves which, by being unbordered, except on the vaginant-laminæ, must be referred to this variety.

F. pusillus, *Wils.* (c. fr.).
P., on brick steps; R., on stones. Abundant on the sandstone rocks in the Winter Garden.

F. incurvus, *Starke* (c. fr.)
Q., side of the boundary ditch.

F. bryoides, *Hedw.*
Very common; fruiting both in wet places, such as the banks of the lake, and on dry sandy banks.

F. crassipes, *Wils.* (c. fr.).
By the riverside, on wood; often submerged at high tide; B., on mortar, wall of tank in Herbaceous Ground (Massee, 1897). One of the most interesting of the Kew mosses, and occurring in fair quantity in the first-mentioned locality. The thick seta easily distinguishes this species in the field.

F. taxifolius, *Hedw.*
Not uncommon in damp places; about the lake; river-side; Palace Grounds; not found in fruit.

Grimmia pulvinata, *Sm.* (c. fr.).
R., on stones; P., on the wall by the river.

Acaulon muticum, *C. Müll.* (c. fr.)
On third island (from Culvert end) in the lake, on stiff clay; and (*A. mediterraneum*, Braithw.) A., sandy ground near the west end of the lake; P., sandy bank (Nicholson).

I do not think that the plant described by Braithwaite under the name of "*Acaulon mediterraneum*, Limpr.," in the British Moss Flora, i, p. 301, deserves to rank higher than a variety of *A. muticum*.

On a sandy bank near Bexhill, Sussex, I have collected an *Acaulon*, in which the long inner bract is completely wrapped round the fruit, and the plants are tall, and sometimes slightly curved,—in fact, agreeing well with *A. mediterraneum* as described in the British Moss Flora, (loc. cit.). Dr. Braithwaite agreed with me in referring the plant to that species. Of the Kew specimens of *Acaulon*, those from the damp ground of the island in the lake have connivent subequal bracts, and capsules scarcely, or not at all apiculate, those from the sandy ground have unequal bracts, with the inner longer one more or less convolute, and the capsule minutely apiculate. I have, however, seen so many plants, from other localities, presenting exactly intermediate characters, that I am strongly of opinion that "*A mediterraneum*" is not specifically distinct from *A. muticum*, but is to be regarded as a variety of the latter, produced (in my experience) in dry sandy localities. It may also be pointed out that Dr. Braithwaite's description of "*A mediterraneum*, Limpr.," does not agree at all well with Limpricht's original diagnosis. (*Rabenh. Krypt. Fl. Deutschland*, iv. (1885) p. 180). Dr. Braithwaite emphasizes the convolute bract, and describes the plant as taller than *A. muticum*; Limpricht says that his species is smaller than *A. muticum*, with leaves smaller, not (or scarcely) connivent, and capsule visible from above, and does not mention the convolute inner bract, nor the apiculate capsule. *A. mediterraneum*, as described by Limpricht, seems altogether nearer to *A. muticum*, var. *minus*, than to the plant described and figured by Dr. Braithwaite as Limpricht's species.

Phascum cuspidatum, *Schreb.* (c. fr.).
Frequent in bare places among the grass; on paths, &c.

Var. **schreberianum,** *Brid.*
Bare places among the gorse, west end of the lake.

Pottia truncatula, *Lindb.* (c. fr.).
Not common. P., Nurseries, &c.

Tortula ambigua, *Angstr.* (c. fr.).
R. (Massee, 1897).

T. marginata, *Spruce.* (c. fr.).
R., abundant on stones ; P., brick steps. Certainly indigenous.

T. muralis, *Hedw.* (c. fr.).
Abundant everywhere, on walls and stones.

Var. **æstiva**, *Brid.*
Fernery, one or two tufts of a well-marked state of this variety.

T. intermedia, *Berk.*
R. Several tufts, here and there, on the stones, barren ; also in fruit (Massee, 1897).

Barbula rubella, *Mitt.* (c. fr.).
R. Common.

B. fallax, *Hedw.*
Not uncommon ; riverside and gardens, occasionally fruiting.

B. hornschuchiana, *Schultz.*
Among the grass, near the lake, barren.

B. revoluta, *Brid.*
R. In several places, barren ; also in fruit (Massee, 1897).

B. unguiculata, *Hedw.*
Common throughout the gardens, rarely fruiting.

B. lurida, *Lindb.*
R. Sparingly, and barren.

B. vinealis, *Brid.*
R. In several places, barren.

Weisia squarrosa, *C. Müll.* (c. fr.).
On mud thrown up from a ditch, near pumping station, in fruit (Massee, 1897).

W. viridula, *Hedw.* (c. fr.).
Q., common along the boundary ditch.

Trichostomum tortuosum, *Dixon.*
R. Very sparingly and barren, on stones.

Cinclidotus fontinaloides, *P. Beauv.*
Not uncommon by the river, fruiting occasionally.

Encalypta streptocarpa, *Hedw.*
R. On stones, barren.

Orthotrichum anomalum, *Hedw.* var. **saxatile**, *Milde.* (c. fr.).
R., a few tufts ; on a wall, by the river-side.

O. affine, *Schrad.* (c. fr.).
By the river-side, very sparingly, on a stone wall.

O. diaphanum, *Schrad.* (c. fr.).
Wall, by the river, sparingly.

Ephemerum serratum, *Hampe* (c. fr.).
On a bank near the south end of the lake.

Physcomitrium pyriforme, *Brid.*
Patches of fruiting plants here and there by the river-side.

Funaria fascicularis, *Schimp.*
P. A few fruiting plants, on a sandy bank, with *Bartramia pomiformis*, certainly native. A. Mr. G. Nicholson and Mr. E. M. Holmes have gathered it near the flagstaff, but it has now disappeared from this locality.

F. hygrometrica, *Sibth.* (c. fr.).
Abundant everywhere—in the driest places, as on cinders, as well as by the river-side, where it is often submerged.

Aulacomnium androgynum, *Schwaeg.*
Q. Gemmiferous state; on elder tree. A. On a tree near the flagstaff.

Bartramia pomiformis, *Hedw.*
Q., quite wild; boundary ditch; P. In both places with a few capsules.

Leptobryum pyriforme, *Wils.*
R. Not uncommon; fruiting on stones. P. On ground, among grass. Occurs commonly in pots in the glass-houses, forcing-pits, &c.

Webera nutans, *Hedw.* (c. fr.).
Common. Q., on stumps; A., Bamboo garden, &c.

W. carnea, *Schimp.*
Barren; bamboo garden; river-side.

Bryum inclinatum, *Bland.*
R., in fruit; A., Rose garden.

B. pallens, *Sw.*
R., on a wet bank; a dark-green form with numerous protonematoid branches.

Mr. Dixon reported on it: "I believe your *Bryum* is a form of *B. pallens*. It has the peculiar areolation of that which is somewhat hard to define, decurrent leaves, etc. The var. *speciosum* is something like it, but not quite the same. The tips of the branches show a little of the characteristic vinous red of *pallens*. The gemmiform threads I should take to be an *abnormal* outgrowth such as one finds in mosses growing in unusually damp situations."

B. pseudo-triquetrum, *Schwaeg.*
By the river-side; A., near rose garden. Barren.

B. cæspiticium, *Linn.* (c. fr.).
Not uncommon. R., &c.

B. intermedium, *Brid.* (c. fr.).
Q., in an open spot.

B. capillare, *Linn.*
R., abundant, fruiting; Q., boundary ditch, &c.

B. donianum, *Grev.*
R. One tuft, with a few capsules.

B. erythrocarpum, *Schwaeg.*
Not uncommon, often among grass. Bamboo garden, P., &c.

B. atropurpureum, *Web. et Mohr* (c. fr.).
A., on stumps near lake.

B. argenteum, *Linn.*
On paths, roofs, stones, &c. ; occasionally fruiting.

Var. **lanatum**, *Bruch et Schimp.*
Commoner than the type in the area ; occurring in dry places, especially on walls exposed to the sun. All authors, without exception, as far as I can find, describe the nerve of the leaf of *B. argenteum* as ceasing below the apex, and it does not seem to have been noticed that in the var. *lanatum* the nerve is distinctly excurrent. Most authors describe only the shape of the leaf as characteristic of the var. *lanatum*, without referring to the nerve ; Husnot (*Musc. Gall.* i., 243), however, describes and figures the nerve as very short. In the Kew plant, as mentioned above, as well as in all other examples of the var. *lanatum* that I have seen, the nerve is distinctly excurrent, and I believe that this structure is characteristic of the variety.

Mnium affine, *Bland.*
Amongst grass. P.

M. cuspidatum, *Hedw.* (non *Neck.*).
R. Occasionally producing a few capsules ; originally found by Mr. G. Nicholson.

M. rostratum, *Schrad.*
Not uncommon in dry places among the grass ; fruiting in the Queen's Cottage Grounds (Massee, 1897).

M. undulatum, *Linn.*
Q. ; P. Sparingly.

M. hornum, *Linn.* (c. fr.).
Common ; very fine in Q., P., &c.

M. stellare, *Reichb.*
In one place in the Rockery.

Fontinalis antipyretica, *Linn.*
In the moat by the river.

Neckera crispa, *Hedw.*
R. Very sparingly, and starved.

Porotrichum alopecurum, *Mitt.*
Q. ; also occurs in the Winter Garden.

Leskea polycarpa, *Ehrh.*
By the river-side ; frequent on wood ; occasionally on the stone wall ; often fruiting. Probably the same station as that indicated in De Crespigny's "New London Flora," p. 90 (1877).

Thuidium tamariscinum, *Bruch et Schimp.*
P. ; Q. ; A., fine and plentiful, on banks near the bamboo garden.

T. recognitum, *Lindb.*
Among grass, P. (Massee, 1898.)

Pleuropus sericeus, *Dixon.*
Frequent on stones and walls ; R., river-side, &c. ; not noticed in fruit.

Brachythecium albicans, *Bruch et Schimp.*
Bank by the North Gallery ; among grass about the lake ; river-side, between the west boundary and Isleworth Gate.

B. rutabulum, *Bruch et Schimp.*
Common and fruiting freely.

B. velutinum, *Bruch et Schimp.* (c. fr).
Rather common ; islands in the lake ; Q., boundary ditch ; P., &c. Plants from the Palace grounds have long setæ, and drawn out stems, and agree with the var. *prælongum* of the Bryologia Europæa, which cannot, however, be considered more than a form.

B. populeum, *Bruch et Schimp.*
Fernery (fruiting) ; R. ; wall by river.

B. purum, *Dixon.*
Common among the grass, &c.

Eurhynchium piliferum, *Bruch et Schimp.*
P., in one place ; native.

E. prælongum, *Bruch et Schimp.*
Abundant everywhere ; occasionally fruiting. Also occurs fruiting in some of the Houses, e.g., Winter Garden.

E. Swartzii, *Hobkirk.*
On the ground, river-side ; P. ; Q., boundary ditch, also a very pretty form, more closely branched than usual, on stones near the Cumberland Gate ; Winter Garden.

E. pumilum, *Schimp.*
P. ; also occurs plentifully on stones in the Winter Garden.

E. tenellum, *Milde.*
R., barren. Fruiting on Tree-Fern stems in the Winter Garden ; these plants have quite smooth setæ, so that they cannot be referred to the var. *scabrellum*, Dixon, which is the usual form found on tree trunks, stumps, twigs, &c. Mr. W. E. Nicholson informs me, however, that he has met with the type occasionally on trees, in Sussex.

E. rusciforme, *Milde.*
Abundant, and fruiting freely, by the river.

E. murale, *Milde.*
Not uncommon on stones ; R., &c., fruiting freely.

E. confertum, *Milde.*
Abundant in fruit. P. ; wall by the river ; R., &c.

E. megapolitanum, *Milde.*
P., among the grass, on sand, fruiting. Certainly native. Mr. W. E. Nicholson tells me that the Kew plant agrees well with examples collected by him on sandy banks in West Sussex.

Plagiothecium borrerianum, *Spruce.*
Frequent, often forming large patches on sandy banks, as about the Bamboo Garden.

P. denticulatum, *Bruch et Schimp.*
Frequent; R., P., &c. Occasionally fruiting.

P. sylvaticum, *Bruch et Schimp.* (c. fr.).
Q.; P. Sparingly.

Amblystegium serpens, *Bruch et Schimp.* (c. fr.).
Abundant everywhere.

A. varium, *Lindb.*
In a few places by the river.

A. filicinum, *De Not.*
R. Common; on wall by river-side.

A. Kochii, *Bruch et Schimp.*
In one or two spots by the river. Hitherto only known in Britain from Hurstpierpoint, Sussex.

Hypnum riparium, *Linn.* (c. fr.).
About the lake, on the islands; all along the river-side.

H. elodes, *Spruce.*
On an old stump, near the Cumberland Gate, in fruit (Massee, 1897). A very interesting record. Unfortunately the species cannot be refound, and it is probable that it has disappeared from the original locality through the formation of a rockery.

H. stellatum, *Schreb.*
R., very sparingly.

H. cupressiforme, *Linn.*
Abundant.

Var. **resupinatum,** *Schimp.*
R.; boundary ditch; P., &c., not uncommon.

Var. **filiforme,** *Brid.*
On trees. Q.; A.

H. molluscum, *Hedw.*
R., in a few places.

H. palustre, *Linn.*
Here and there by the river-side. A curious form, growing on wood more or less submerged at high tide, is thus reported on by Mr. Dixon: "I take your moss to be a curious form of *H. palustre*; a single-nerved form, but nerve sometimes very feeble. The leaf-apex is characteristic, and on some of the stems the leaves have the secund position usual in the species."

H. cuspidatum, *Linn.*
P.; R.; among the grass in many places.

H. Schreberi, *Willd.*
Abundant in the Pinetum, near the Water-Lily Pond.

Hylocomium squarrosum, *Bruch et Schimp.*
Very common among the grass under trees.

APPENDIX.

The following species have occurred in the glass-houses only :—

Physcomitrium eurystomum, *Sendt.* (c. fr.).
On earth, in a pot, No. 2 House (Nicholson).

Aulacomnium palustre, *Schwaeg.*
Common in several of the Houses, especially the Filmy-Fern House, in the gemmiferous state. First noticed here by Professor Bower, see Journ. Linn. Soc. (Bot.), xx. (1884), p. 465, where an account of the structure and germination of the gemmæ is given. The pseudopodia are sometimes quite leafless, just as in *A. androgynum.*

Fissidens Nicholsonii, *Salmon.*
Mr. Nicholson discovered this *Fissidens* growing in one of the Houses, on a Tree-Fern stem, brought from Jamaica. It proved on examination to be a new species allied to *F. Ravenelii*, Sulliv., and is to be described and figured as *F. Nicholsonii* in the *Annals of Botany.*

Hypopterygium viridulum, *Mitt.*
Trunks of Tree-Ferns, Winter Garden.

Rhizogonium pennatum, *Hook f. et Wils.*
Common in the Filmy-Fern House.

Cyathophorum pennatum, *Brid.*
At the base of Tree-Fern stems, Winter Garden.

ERNEST S. SALMON.

DCXXXVIII.—MISCELLANEOUS NOTES.

Retirement of Mr. J. G. Baker.—The termination of the official services of this well-known member of the Kew staff on reaching the age limit on January 12th of the present year, cannot be passed over without a brief record. Mr. John Gilbert Baker, having already acquired a reputation as a critical botanist, entered the Herbarium and Library of the Royal Botanic Gardens in 1866 as Assistant. He became successively a Principal Assistant in 1884, and Keeper in 1890. Gifted with exceptional powers of sustained work, he devoted unflagging energy to his laborious official duties. He became the acknowledged authority on the nomenclature and classification of Ferns and of Petaloid Monocotyledons. His non-official hours were no

less profitably employed. The following list comprises the more important works which he turned out with untiring industry in the time which was at his own disposal :—

1863.—North Yorkshire ; Studies of its Botany, Climate, and Physical Geography.
1866.—Flora of Northumberland and Durham.
1868.—Synopsis Filicum (with Sir W. J. Hooker). 2nd edition, 1874.
1869.—Synopsis of Narcissus.
1869–1873.—Refugium Botanicum (4 vols.).
1870–1879.—Monograph of Liliaceæ (Journal of Linnean Society.)
1871.—Monograph of British Roses.
1870–1884.—Ferns and Compositæ of Brazil.
1871.—Leguminosæ of Tropical Africa.
1873.—Synopsis of Crocus.
1875–1898.—Contributions to Botanical Magazine.
1875.—Elementary Lessons in Botanical Geography.
1876.—Systema Iridacearum.
1877.—Flora of Mauritius and Seychelles.
Synopsis of Agave.
1878.—Welwitsch's Petaloid Monocotyledons of Angola.
1879.—Leguminosæ of British India.
1879–1890.—Descriptions of New Plants from Madagascar (1,200 species).
1880.—Monograph of Isoetes.
1882.—Watson's Topographical Botany. 2nd edition.
Synopsis of Selaginella.
1884–5.—Presidential Address to Yorkshire Naturalists' Union.
1885.—Flora of English Lake District.
1886.—Hooker's Icones Plantarum, Vol. XVII. (Ferns).
Handbook of Fern Allies.
1887.—Handbook of Amaryllideæ.
1889.—Handbook of Bromeliaceæ.
1892.—Handbook of Irideæ.
Scitamineæ of British India.
1896–7.—Flora Capensis, Vol. VI. (Petaloid Monocotyledons).
1898.—Petaloid Monocotyledons of Tropical Africa.

The production of this immense amount of technical work of acknowledged merit not merely added lustre to the establishment, but was of immense value to it. Under these circumstances an application was made to the Treasury for a special grant in excess of the prescribed rate of pension. This, however, my Lords, while "fully aware of the good service rendered by Mr. Baker," declined to give. Mr. Baker was elected a Fellow of the Royal Society in 1878.

Keeper of the Herbarium and Library.—The appointment of Mr. William Botting Hemsley, F.R.S., a Principal Assistant in the Herbarium and Library of the Royal Botanic Gardens, to the post of Keeper in succession to Mr. J. G. Baker, retired, was

approved by the First Commissioner of Her Majesty's Works and Public Buildings. Mr. Hemsley took up his duties on 13th January of the present year.

Principal Assistant (Phanerogams).—The appointment of Dr. Otto Stapf, Assistant for India since 1891, as Principal Assistant in succession to Mr. Hemsley, promoted, was approved by the First Commissioner. Dr. Stapf took up his duties on January 13th of the present year.

MR. WILLIAM LESLIE, a member of the gardening staff of the Royal Gardens, has been appointed, on the recommendation of Kew, by the Secretary of State for the Colonies, Assistant Superintendent of the Royal Botanic Gardens, Trinidad, in succession to Mr. William Lunt, appointed Curator, Botanic Station, St. Kitts.

Visitors during 1898.—The number of persons who visited the Royal Botanic Gardens during the year 1898 was 1,277,215. That for 1897 was 1,239,683. The average for 1888–97 was 1,444,716. The total number on Sundays was 484,054, and on week-days 793,161. The maximum number on any one day was 71,871 on May 30, and the smallest 67 on November 21.

It is remarkable that while the total number fluctuates within comparatively narrow limits, the aggregate attendance on week-days increases, while that on Sundays diminishes. In 1891 they nearly balanced.

The detailed monthly returns are given below :—

January	20,643
February	19,995
March	33,844
April	182,494
May	181,551
June	169,003
July	212,338
August	251,971
September	124,059
October	39,206
November	23,787
December	18,324

MRS. BARNARD.—This lady, the wife of Major R. Cary Barnard, F.L.S., of Cheltenham, the daughter of the late Professor J. S. Henslow, and sister-in-law of Sir Joseph Hooker, died on January 19th. Inheriting in no small degree her father's taste for botany, she was a very good botanical artist, and contributed a considerable number of plates to the *Botanical Magazine* between

the years 1879 and 1886. She also made the drawings for the wood-cuts which illustrate Professor Oliver's *Lessons in Elementary Botany*, a well-known and popular introduction to systematic botany, in part based upon materials left in manuscript by Professor Henslow himself.

Botanical Magazine for December.—The present number completes the 124th volume, which is dedicated to Mr W. B. Hemsley, F.R.S., at the date of publication Principal Assistant in the Herbarium of the Royal Gardens. All the five plants figured are in cultivation at Kew. *Musa Bakeri* is a new species, supposed to be a native of Cochin China. It was obtained from the Jardin des Plantes, Paris. The Kew plant, which has a stem 10 feet high, flowered for the first time in October, 1895. *Cardamine latifolia*, from the Pyrenees and Southern Italy, is a robust plant with rather large, rosy-lilac flowers. *Paphiopedilum mastersianum*, native of Java, was sent to Kew by Messrs. Sander & Co., of St. Albans. It is an unusually handsome species both in leaves and flowers. *Caladenia carnea*, var. *alba*, a terrestrial orchid from Eastern Australia and Tasmania, was received from Mr. J. O'Brien, of Harrow-on-the-Hill. The disk of the recurved lip is furnished with two or more rows of stalked, capitate glands, *Fritillaria pluriflora*, a decidedly ornamental species from Northern California, whence bulbs were sent to Kew by Mr. Carl Purdy, of Ukiah, has rose-coloured flowers an inch long, and about two inches wide, arranged in a loose raceme.

Botanical Magazine for January.—*Acalypha hispida* (A. Sanderi), is the handsome subject of the first plate of the new volume. Though so recently introduced into European gardens, its merit as a highly ornamental plant for stove cultivation has become well established. The specimen figured was received from Messrs. Sander, of St. Albans, plants having been sent to them by their collector from the Bismarck Archipelago, in 1896. *Lewisia Tweedyi* is a native of the Wenatchee mountains, in Washington State, U.S.A. It is a stemless, somewhat succulent plant, with flowers three inches in diameter; the petals are straw-coloured, becoming bright pink at the tips and edges. The Kew plant was acquired by purchase. The very pretty *Lilium rubellum* was first described early last year from material received from Messrs. Bunting, of Chelmsford. It is a native of Japan, and allied to *L. japonicum*, but the flowers are smaller and pink. *Gaultheria trichophylla* is a diminutive species from the Himalaya and Western China. The Kew plants were received from the Hon. Charles Ellis, of Frensham Hall, Haslemere. *Meconopsis heterophylla*, from California, is the only American species of the genus. The plant figured was raised from seed received from a Californian nurseryman.

Kirk's Student's Flora of New Zealand.—The death of Professor T. Kirk, of New Zealand, was announced in the *Kew Bulletin* (1898, p. 57), where, also, reference was made to his unfinished work bearing the above title. Since then Sir James Hector, Director of the Geological Survey of New Zealand, and of the New Zealand Institute, has sent Sir Joseph Hooker "clean sheets" of the work, so far as it has been printed off; and they have been presented by him to Kew. It is gratifying to learn from the same source that this fragment will be published, and that another botanist will probably be commissioned to write a *Flora* of the country on a less comprehensive plan. Kirk's *Flora* is, as far as completed, admirable in method, and, as far as possible, exhaustive in treatment. It is a matter of deep regret that the author did not live to complete it, as it can hardly be hoped that any other botanist will be found to take up the unfinished task with Kirk's local, botanical, and literary skill. But what is more imperatively required, in the first place, is a handy and cheap book, in which the plants are described in familiar language, without any attempt on the part of the author to reach finality; that is to say, to discriminate critical forms, or to wait for complete specimens of rare species in order to be able to fully describe them.

The fragment of Kirk's *Flora* comprises the orders Ranunculaceæ to Compositæ, covering 363 large octavo pages; or, more space than the whole of the flowering plants and ferns occupy in Hooker's *Handbook*. It is true that the author includes numerous introduced plants; but many of these are so abundant and so widely spread that they form an important, or at least a conspicuous part of the vegetation in certain districts. Some, indeed, pervade the whole country, and it is as necessary for the student to have means of identifying them as the rarer aboriginal plants. To the beginner they are as much natives as the others. In Kirk's work the names and descriptions of the introduced plants are printed in different type from the rest.

The Ferns of North-Western India.—Mr. C. W. Hope, late of the Public Works Department, Government of India, who devoted much of his leisure time while in India to the study of ferns, has, since his retirement, continued his studies at Kew, and is on the eve of publishing a detailed account of all the species inhabiting the North-Western Provinces and adjoining territories. This partially descriptive enumeration will shortly appear in the *Journal* of the Bombay Natural History Society, and will be illustrated by a number of plates.

Para Rubber in Penang.—A brief reference to the experimental production of this rubber was given in the *Kew Bulletin* for 1898, p. 273. Two samples have since been received from Mr. C. Curtis, the Assistant Superintendent of Forests, both of which were

taken from a tree growing in the Botanic Garden, the quantity collected amounting to three pounds. One sample had been coagulated with, and the other without, alum, but both were dried by fire heat. Accompanying the samples was a bag of chips or shavings of the wood of the rubber tree, containing a quantity of the coagulated juice; it was thought that they might prove a marketable article for the extraction of the rubber. All the samples were submitted to Messrs. Hecht, Levis, and Kahn, the well-known rubber brokers of Mincing Lane, who kindly furnished the following report under date February 3rd, 1899:—"The rubber shavings are almost valueless, containing as they do only small traces of rubber. We estimate the value of these shavings from 4*d.* to 5*d.* per pound. The other two samples are of excellent quality, and would meet with a ready sale at probably about 3*s.* 6*d.* per pound, if the bulk of the rubber is equal in dryness to the two small cakes you have sent us. The treatment of No. 1 with alum does not in any way interfere with the quality."

Para Rubber in Perak.—The experimental cultivation of Para Rubber in the Straits Settlements has been discussed in the *Kew Bulletin*, 1898, pp. 271–274.

The following report gives a higher valuation for the produce of the trees grown in Perak than that already quoted.

THE SUPERINTENDENT, GOVERNMENT PLANTATIONS, PERAK, to THE SECRETARY TO GOVERNMENT, PERAK.

Government Plantations Office,
Taiping, October 3, 1898.

SIR,

I have the honour to forward herewith a copy of the correspondence in connection with a parcel of Para Rubber (208 pounds sheet, and 8 pounds scrap), prepared at Kuala Kangsar, and sent home for sale.

The correspondence is interesting, as it shows market value of Para Rubber grown in Malaya. The parcel realised $293.90, exclusive of charges.

The Rubber was valued at about 3*s.* 5*d.* per pound, but sold for 3*s.* 1*d.* owing to the cost of analysis.

The analysis showed a loss of 26½ per cent. in washing, but the manufacturers think that if sent home in bulk, the loss would be 30 per cent., as a large quantity could not be sent home so dry.

I have, &c.,
(Signed) R. DERRY,
Superintendent of Government Plantations.

Mauritius Tea.—The cultivation of tea in Mauritius, has been discussed in the *Kew Bulletin* for February, 1887, p. 7; and 1892,

pp. 234–238. The following is the most recent information with regard to it :—

EXTRACT from the Annual Report on Mauritius and Rodrigues for 1897, p. 27.

The cultivation of tea has been extended, and produce of excellent quality has been put on the market in limited supplies. While the quality is sufficiently good to enable it to compete on the English market, the scale on which it has been produced has not been sufficiently large to show whether the cost of manufacture will permit of exporting it profitably.

Coffee-leaf Disease in Zanzibar.—The occurrence of this fungus-parasite in German East Africa was recorded in the *Kew Bulletin* for 1894 (p. 412). According to *The Shamba: Journal of Agriculture for Zanzibar*, September, 1898, it has now made its appearance in Zanzibar. The statement, though not improbable, has not been verified, as far as is known, by a scientific examination :—

" Some of the Liberian coffee trees at Mbweni bear the unmistakable stamp of the well-known coffee-leaf disease (*Hemileia vastatrix*). The disease is a fungus which first attacks the under side of the leaves causing spots or blotches at first yellow but subsequently turning black. These blotches are, on examination, found to be covered with a pale, orange-coloured dust or powder which easily rubs off. The blotches gradually increase in size till at last they have spread over the leaves, which then drop off, leaving the trees in a short time quite bare, in which state they are of course unable to produce crop or bring that which may have already been produced to maturity. Its ravages in Ceylon in the eighties converted hundreds of acres of beautiful Arabian coffee into withered sticks, as if a fire had raged through the fields. The whole of the Eastern world was more or less infected from Ceylon, but as far as we know this is the first actual appearance of the disease in Zanzibar. The Liberian species is not supposed to be subject to its attacks, and this makes its appearance at Mbweni all the more interesting. Otherwise the trees there show a most robust and healthy growth in spite of dry weather."

Fungus-gamboge.—Zopf gives this name (*Bot. Ztg.*, 1889, p. 53), to a yellow substance obtained from *Polyporus hispidus*, Fries, which corresponds in all its characters to gamboge-yellow, the chief constituent of gamboge. It is insoluble in water, but readily soluble in ether and alcohol; it is dissolved with the formation of a red colour in concentrated nitric or sulphuric acid, and precipitated as yellow scales from these solutions on the addition of water. The colouring matter is abundant in the cell-walls, cell-contents, and also as an excretion on the surface of the hymenium. *Polyporus hispidus* is a common fungus, and could be obtained in quantity, should fungus-gamboge prove to possess any economic value.

Professor Hummel, of the Dyeing School, Leeds, was kind enough to examine the colouring matter, and furnished the following report :—

PROF. HUMMEL TO ROYAL GARDENS, KEW.

Clothworkers' Departments,
The Yorkshire College, Leeds,
November, 1897.

DEAR SIR,

HEREWITH enclosed I send you two pieces of calico mordanted with iron and aluminium in a stripe pattern, and dyed with (*a*) Old Fustic (*Morus tinctoria*), (*b*) *Polyporus hispidus*, received from you.

The experiment shows that *P. hispidus* contains a yellow mordant-colouring-matter in moderate quantity, but the colours obtained are not bright enough, nor is the fungus sufficiently rich in colouring matter to render it of commercial value in Europe.

If you will be good enough to procure about 10 lbs. weight of the fungus, it will be worth while making a chemical examination to determine what the colouring matter is.

Yours truly,
(Signed) J. J. HUMMEL.

W. T. Thiselton-Dyer, Esq., F.R.S.,
Director, Royal Gardens, Kew.

Agaricus (Armillaria) melleus, Vahl.

Wyman & Sons, L^td. Lith, 3576. / 99.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 147-148.] MARCH and APRIL. [1899.

DCXXXIX.—PLANT DISEASES—I. TREE ROOT-ROT.

(*Agaricus* [Armillaria] *melleus*, Vahl.)

(With Plate.)

Notwithstanding the existence of numerous excellent treatises and handbooks on the diseases of plants produced by parasitic fungi, there appears to be still a need of descriptions of the more common ones in moderately popular language, accompanied by characteristic portraits of the organisms and of the mischief they effect. Some semi-official correspondence has taken place between Kew and the Board of Agriculture on the subject. It has been decided, therefore, to publish a series of articles in this form from time to time in the *Kew Bulletin*. They may possibly be collected eventually into a volume, which will be sold separately.

Agaricus melleus is one of the most generally distributed and destructive of "toadstools," attacking all kinds of fruit trees, many broad-leaved forest trees, also all European and many imported conifers. Hartig records having recognised its mycelium in fossil wood of *Cupressinoxylon*. As a saprophyte it occurs in dense clusters at the base of stumps, and also on posts and worked timber.

The cap or pileus is 2 to 3 inches across when expanded, pale honey-colour, and ornamented with numerous minute scales; stem 4 to 6 inches long, coloured like the pileus; gills white, with just a suspicion of pink, and, when young, hidden by a membrane stretching from the stem to the edge of the pileus. As the latter expands this membrane breaks away from the edge of the pileus and forms a ring or collar round the stem. The spores are white, and settle on objects under the gills in the form of a dense white powder.

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The fruit of the fungus is usually not formed until the tree has been killed, or nearly so, by its mycelium; nevertheless, the disease is indicated by the pale colour of the leaves and the stunted branches, and, in the case of conifers, by the great accumulation of extruded resin round the collar.

The spores of the fungus dispersed by wind and carried by the fur of animals, &c., germinate and first form a delicate, white cobweb-like mycelium, which soon produces blackish, cord-like, radiating strands of mycelium called *rhizomorphs*. These bodies, which vary in thickness from that of thick thread to moderately thick twine, continue to increase in length, travelling a few inches underground, until they come in contact with the root of a tree, when the cortex is pierced and a firm white sheet of mycelium is formed between the cortex and the wood. This felt gradually passes up the trunk for some distance between the bark of the wood, and also extends into other sound roots. At the same time the rhizomorphs continue to spread over the surface of the roots and the collar, entering the cortex at various points. Delicate strands of mycelium extend from the felt formed under the cortex into the wood, principally along the medullary rays, and thence pass into the vessels, which soon become choked with a dense mass of mycelium.

In conifers the mycelium fills the resin-canals and destroys the cells forming their walls, the resin exuding through the bark in large quantities and collecting round the collar; hence the name "resin-flux" sometimes given to this disease.

At a later stage of the disease the surface of the roots and collar are covered with a white felt of mycelium, which exhibits a pale phosphorescent light in the dark.

After the death of the tree, numerous stout, branching, black rhizomorphs form a network between the wood and the bark.

Finally, after a tree has been attacked and the mycelium of the fungus well developed, numerous rhizomorphs spread underground, where they continue to extend until they come in contact with the roots of some neighbouring tree, which is attacked and killed, forming in turn the starting point from which rhizomorphs again wander in search of other victims.

Preventive Measures.—There are two methods by which a tree may become infected:—(1) spores; (2) underground rhizomorphs. Infection by means of spores may be prevented by destroying all fungi growing in the neighbourhood of valuable trees. The fungi should be collected and burned; kicking over and trampling under foot simply disperses the spores and does more harm than good.

If a tree is suspected of being diseased, this can soon be ascertained to a certainty by exposing the base of the trunk and a root; the presence or absence of white mycelium under the cortex will decide the question. If other trees grow in the vicinity of a diseased tree, the latter should be isolated by means of a narrow trench about 9 inches deep, made at a distance of 3 or 4 yards from the trunk of the diseased tree, for the purpose of intercepting the progress of underground rhizomorphs. The soil removed in digging should be thrown inside the trench.

G. MASSEE.

Description of Figures.—Fig. 1, a cluster of *Agaricus* (Armillaria) *melleus*, Vahl, nat. size; 2, section of a fungus, showing the gills running for some distance down the stem (decurrent) and producing at the base of the stem black cord-like strands of mycelium or rhizomorphs; nat. size.

DCXL.—ARTIFICIAL PRODUCTION OF INDIA-RUBBER.

India-rubber, or caoutchouc, is chemically a hydrocarbon. But what is called its molecular constitution is unknown. All that has been ascertained is that when decomposed by heat (distillation in closed vessels) it is broken up into simpler hydrocarbons, amongst which is isoprene.

Caoutchouc is found in a considerable number of plants in no way related by botanical affinity. But they are for the most part natives of tropical countries. As is well known, it occurs in the *latex*, a milky juice contained in the laticiferous vessels. It is not dissolved in the latex but is merely suspended in it.

All chemical substances of vegetable origin sooner or later yield to the art of the synthetic chemist, and admit, therefore, of being built up from simpler compounds. The methods of accomplishing this in individual cases may or may not lead to commercial results. In many cases they remain merely of theoretical interest as, though practicable, they are too cumbrous and expensive to be of actual utility.

The artificial production of every organic compound is, then, a scientific problem which may have commercial results. It is always a matter of interest to note and place on record the first step towards its solution, although the commercial application may be remote.

Such a first step has been achieved by Dr. Tilden, F.R.S., Professor of Chemistry in the Royal College of Science, South Kensington, in the case of india-rubber. He has kindly permitted the republication of his results in these pages with some more recent revisions. They have also been republished in the *Chemical News.*

"*Note on the Spontaneous Conversion of Isoprene into Caoutchouc.*

"[Read before the Birmingham Philosophical Society, May 18th, 1892.]

"Isoprene is a hydrocarbon which was discovered by Greville Williams many years ago among the products of the destructive distillation of india-rubber. Later, in 1884 (*Trans. Chem. Soc.*, vol. 45, p. 410), it was observed by myself among the more volatile compounds obtained by the action of a moderate heat upon oil of turpentine and other terpenes. It is a very volatile

liquid, boiling at about 36°. Its molecular formula is $C_5 H_8$, and it forms a tetrabromide, $C_5 H_8 Br_4$, but no metallic derivatives like the two homologues of acetylene.

"Bouchardat (*Compt. rend.* vol. 87, p. 654, and vol. 89, pp. 361 and 1117) observed that when isoprene is heated to a temperature near 300°, it gradually polymerises into a terpene, which he called diisoprene, but which is now called dipentene. This compound boils at 176°. A quantity of colophene, similar to that which is produced by the action of heat upon turpentine, is formed at the same time. When isoprene is brought into contact with strong acids, aqueous hydrochloric acid for example, a small portion of it is converted into a tough elastic solid, which has been examined by G. Bouchardat and by myself. It appears to be true india-rubber.

"Specimens of isoprene were made from several terpenes in the course of my work on those compounds, and some of them I have preserved. I was surprised a few weeks ago at finding the contents of the bottles containing isoprene from turpentine entirely changed in appearance. In place of a limpid colourless liquid, the bottle contained a dense syrup in which was floating several large masses of a solid of a yellowish colour. Upon examination, this turned out to be india-rubber. The change of isoprene by spontaneous polymerisation has not, to my knowledge, been observed before. I can only account for it by the hypothesis that a small quantity of acetic or formic acid had been produced by the oxidising action of the air, and that the presence of this compound had been the means of transforming the rest. The liquid was acid to test paper, and yielded a small portion of unchanged isoprene.

"The artificial india-rubber, like natural rubber, appears to consist of two substances, one of which is more soluble in benzene or carbon bisulphide than the other.

"A solution of the artificial rubber in benzene leaves on evaporation a residue which agrees in all characters with a similar preparation from Para-rubber.

"The artificial rubber unites with sulphur in the same way as ordinary rubber, forming a tough elastic compound.

"The constitutional formula of isoprene is now known to be :— Methyl-crotonylene, $CH_2 = CCH_3 - CH = CH_2$.

"It is obvious that compounds such as these, containing doubly-linked carbon, may polymerise in a variety of ways ; and, in the present condition of our knowledge even of isoprene, it would be idle to speculate as to which out of the numerous possible arrangements would correspond to the constitution of caoutchouc."—(*Proc. Birm. Phil. Soc.* viii., Pt. I.)

In a recent letter Professor Tilden states :—"As you may imagine, I have tried everything I can think of as likely to promote this change, but without success. The polymerisation proceeds *very* slowly, occupying, according to my experience, several years, and all attempts to hurry it result in the production not of rubber but of 'colophene,' a thick sticky oil quite useless for all the purposes to which rubber is applied."

DCXLI.—LAGOS RUBBER INDUSTRY.

In the *Kew Bulletin* for 1895 (pp. 241–247) an account is given of the important commerce which had resulted in Lagos from the collection of rubber from the Ire tree (*Kickxia africana*). It is, however, to be feared that this source of wealth to the Colony will be short-lived, owing to the reckless way in which the rubber trees had been exhausted by the rubber collectors.

The reports given in the following correspondence depict a state of things which, unless arrested by some remedial measures, can only lead to the extinction of the industry. These reports are highly creditable to the two young Africans, Messrs. Leigh and Dawodu, by whom they were drawn up. As stated in the *Kew Bulletin* (1893, p. 365), they have had the advantage of training in the Botanical Department of Jamaica and subsequently at Kew.

The Ire tree, or, as it is locally called, the "female Ire tree," is *Kickxia africana*, an Apocynaceous tree. The "male Ire tree" appears to be *Holarrhena africana*, also Apocynaceous. In the *Kew Bulletin* for 1895 (p. 245) it is described by an oversight as Rubiaceous. It yields rubber oil apparently of little commercial value.

The *Ficus* referred to in the reports is probably *Ficus Vogelii*, discussed in the *Kew Bulletin* for 1888 (pp. 253-261) and 1890 (pp. 89–93), the extraction of rubber from which appears to have met with little success. It was first indicated as a source of rubber in the *Kew Report* for 1878, p. 39.

Governor McCallum to Mr. Chamberlain.

Government House,
Lagos, 24th June, 1897.

Sir,

In despatch "Interior," dated 9th February, 1897, paragraphs 5 and 6, Captain Denton referred to the wholesale destruction of rubber trees in the Hinterland, and the consequent injury to a most important industry of the Colony. He reported that he had sent Messrs. Leigh and Dawodu of the Botanical Department to Ibadan, with a view to the protection of this industry, and he recommended the establishment of a small Forest Department.

2. I have now the honour of forwarding copy of report received from Messrs. Leigh and Dawodu, from which you will observe that Captain Denton's fears have been more than realised, and that the destruction is very widespread, extending to the Ekiti-Parapo Confederacy as well as to Ibadan and Jebu. I also enclose return for the last six months from the Acting Collector of Customs, showing that there is a falling off in export of rubber amounting to 33 per cent. compared with 1896.

3. This falling off is serious, for—*cæteris paribus*—it means a corresponding diminution of imports, and therefore of revenue. I do not, however, anticipate any serious reduction of revenue, for, from other causes, the total amount which has been collected for five months is not below that estimated.

4. I, moreover, entertain hopes that the present visit, for the first time in history, of kings and chiefs of the Hinterland, with their numerous followers, will be of the greatest benefit to the Colony, and be the means of securing a marked increase of trade with the interior.

5. It is important, however, to take steps which will protect the forests from being ruthlessly destroyed, and which will allow young rubber trees to mature before they are tapped by irresponsible collectors. I therefore cordially endorse Captain Denton's recommendation as to the necessity of a Forest Department.

* * * * *

7. I hope also to organise some system by which the native chiefs will exercise more control over the collectors, but this I can scarcely do until I visit the country myself, and see what promises to be the best means of securing permanence of supply.

8. In the meanwhile, I have thought it desirable to give you some idea as to how the question stands, for you will probably have its importance represented to you by the merchants of Liverpool and Manchester, who will suffer from the falling off in the supply of rubber which has taken place during the current year.

9. Had the collection been entrusted to the chiefs of Yoruba and their men, it is probable that our controlling influence would have checked the destruction which has taken place, but Fantees from the Gold Coast have not had permanency of supply in their minds when they have destroyed trees in all directions, and imperilled the constant supply of a material for which there is now so much demand.

I have, &c.,

(Signed) HENRY MCCALLUM,
Governor.

The Right Honourable
Joseph Chamberlain, M.P.,
Secretary of State for the Colonies.

[Enclosure.]

SIR, Ife, May 25th, 1897.

WE beg respectfully to report to you our work and progress since we left Ibadan.

We should state that before leaving Ibadan we had an interview with His Excellency the Acting Governor.

In this interview we informed His Excellency of the ruined state and condition of the Jebu and Ibadan forests which we had then just visited; and also conveyed to him the information we had gathered from those interested in the industry to the effect that there was no rubber forest in the neighbourhood of these two countries that has not been spoiled by overworking.

We were then instructed by His Excellency to go to the Ekiti country, where, we told him, as we were informed ourselves, rubber working was going on then. Accordingly we left Ibadan on the 21st of March for the Ekiti countries, and went as far as Owo, which town, we understand, is the limit of the Protectorate of the Lagos Colony on that side.

But we regret to say that all the rubber forests through which we have passed and visited during the whole tour have all been spoilt by over-tapping; consequently, we thought it our best plan to make it understood to the kings and chiefs of the different towns we visited, that it is the wish of His Excellency the Governor to improve the quality of the rubber, and to make the industry a permanent one: that His Excellency desires this, not only in the interest of trade, but also for the lasting benefit of themselves and children; and that for this purpose we had been sent out by the Government. In order to effect the wish of His Excellency, four important things were impressed on their minds:—

1. Considering the present state of the forests, we strongly advised them to leave off tapping for two years, when all the trees in their forests which have been almost stripped of their barks shall have healed up, and be in a fit state for extracting fresh supply of juice.

2. That after the trees shall have healed up the process of tapping should only have one season in a year, and this should be during the rainy season. We explained that by so doing the trees would be allowed ample time to heal up and thus be in a good state for the next year's tapping.

3. That in tapping the trees the rubber collector should be very particular in making his lateral incisions; these should be 2 feet apart. This we explained is very important as on it depends the life of the trees.

4. In places where juice is available we have seized the opportunity of teaching those who are interested in this industry the proper mode of preparing rubber.

Our present plan is to go round to the Yoruba forests to teach these facts as has been done in the other districts.

We are, &c.,
(Signed) F. G. R. Leigh and
T. B. Dawodu.

The Acting Resident,
Ibadan.

Acting Governor Captain G. C. Denton to Mr. Chamberlain.

Government House,
Lagos, 28th June, 1898.

Sir,

I have the honour to forward a report by Messrs. Leigh and Dawodu, Assistant Curators of the Botanic Station, giving the results of their mission to the interior upon which they were sent by me in February, 1897.

2. I still hold to the view I expressed in my despatch of the 9th February, 1897, on the subject of a Forestry Department, and I think that, though it may not be possible to put in force a drastic Forestry Ordinance, much may yet be done to preserve the rubber and other trees if the Goverment, acting through the authorities of the country, will take upon themselves the supervision of all the forests.

3. I beg to suggest that Messrs. Leigh and Dawodu's report be transmitted to the Director of the Royal Gardens, Kew.

I have, &c.,
(Signed) George C. Denton,
Acting Governor.

The Right Honourable
Joseph Chamberlain, M.P.,
Secretary of State for the Colonies.

[Enclosure.]

Botanic Station, Ebute Meta,
July 28, 1897.

Sir,

We have the honour to submit for the information of His Excellency a general report of the work done during our absence in the interior.

Leaving Lagos on the 8th February we proceeded to Ibadan, *viâ* Epe, where we arrived on the 13th instant. Here we received definite instructions as to the exact nature of our mission.

During our stay at Ibadan, and before we received instructions to proceed further up country, we took the opportunity of visiting the Ibadan and Jebu forests, which are so rich in rubber and timber trees. We regretted to find that though both forests abound in Ire trees (rubber trees) the latter have all been overtapped, and the forests have in consequence been ruined. Large numbers of trees have died from sheer exhaustion, and those that survived were in a very poor condition, and would take a couple of years to recover themselves.

As all rubber-working had practically ceased in the Ibadan and Jebu forests owing to the destruction of the trees, we were instructed by His Excellency to proceed further up country where rubber-working was still going on, and teach the people the best methods of working and preparing rubber, so that the trees may be preserved and the industry made a permanent one.

We accordingly left Ibadan on the 21st of March and proceeded first to the Ekiti countries, where we understood rubber-working was still going on. We found the forests of all these countries to abound, more or less, in Ire rubber trees; but we discovered that all rubber-working had practically ceased even in these far off countries, a consequence due entirely to the overworking of the trees.

As far as we could inspect them all the trees had been overtapped, and consequently many of them were dying, as is the case with the Jebu and Ibadan forests.

We thought it therefore our best plan, seeing the condition of their forests, to call together the kings, chiefs, and townspeople of the different towns we visited, and conveyed to them the wishes of the Lagos Government with regard to the rubber industry.

We called their attention to the ruined condition of all the rubber trees in their forests, and pointed out to them the folly and short-sightedness of the system of "killing the goose for the golden eggs."

We made them to understand that it is the earnest wish of the Lagos Government to make the rubber industry permanent, and to improve the working of it; and that for this purpose we had been sent up to them, but that it is impossible for the industry to last another five years with the present system of working the trees, and that we would strongly advise them, therefore, in accordance with the wishes of the Government, to stop all rubber-working in their forests for the next two or three years, so that the surviving trees might have sufficient time to recover themselves with bark, and to allow young ones (in which their forests abound) to attain tapable sizes. After this period of time every proprietor should then begin to work his bush on quite a different system. That in this way the industry would be permanent, and they would derive yearly income from their forests.

We pointed out to them the great commercial value of this tree, and its financial superiority over cola and palm trees, and therefore strongly urged them to devote as much, if not greater attention to the rearing and cultivation of this tree as they do to the latter ones.

They were made to understand that by doing this they would not only be carrying out the wishes of the Lagos Government, which is a duty incumbent on them, but that they would also be promoting the interest of trade and be benefiting themselves and children.

Finally we told them that it is their duty to stop all intruders in their forests, as it was strangers who had ruined their forests more than the inhabitants themselves.

We regret to report that all over Yorubaland, beginning from Iwo, and as far as we went in this direction, the forests are sparse and there are more fields than anything else. Consequently there are few rubber trees in those parts, and a good deal of what there are are what the natives call the male Ire tree [*Holarrhena africana*]; it produces a similar juice to the female Ire tree, but this coagulates only to the consistency of the soft Ire rubber (*Landolphia* sp.; this deserves investigation as it is very plentiful in some parts and yields abundance of juice).

The only parts where good bits of forest were found were Osogbo, Ila-Oke, Ilobu, Ejigbo.

All over Yorubaland, therefore, we strongly urged the people to take to planting Ire trees, as they do kola and palm trees, where suitable lands are available, explaining how they should be planted, and what a great source of income such an undertaking will be to them in the future. We are pleased to report that the people seemed to fall in readily with this suggestion.

We furthermore impressed on them that the process of tapping should only be done once a year, and during the rainy season, so that sufficient time be allowed the trees to rebark themselves against the next season.

We explained to them the advisability of their allowing fully 2 feet between the oblique lateral grooves: this is just the point where the native tappers destroy the trees; they do not allow more than from 6 to 9 inches between the lateral grooves, thus

leaving a very limited amount of bark between the grooves, subsequently the trees all wither (especially during the dry season) and die.

The mode adopted by the Fantees, who are to be found in good numbers at Owo and its vicinity, for extracting the juice is the one most suitable and convenient. The first point is for the tapper to make a vertical groove ($\frac{1}{2}$ to $\frac{5}{8}$ in. wide) from the bottom to the top of the tree, and in such a way as to gouge out a bit of the true bark; after this is done, and as the tapper is descending, two series of oblique lateral grooves converging towards the main vertical groove are made, of the same width; thus all the exudation of the lateral grooves flows into the main groove which, together with its own exudation, finds its way down to the base of the tree where a receptacle of some kind is placed to receive the milk.

The method the natives adopt for coagulating the juice is a very dirty and improper one, but a better and simpler way of producing a whiter and superior quality was shown them. This is done by adding twice the quantity of water as there is juice (strained), and then gradually heating; by so doing the rubber becomes coagulated, and does not burn up as in the case with the native system. This kind of rubber comes out milky white, and when pressed (to get rid of water), has an agreeable smell and a superior quality. We pointed out to them the advantage gained in taking a little trouble in the preparation, as on it depends the value of their produce.

As there was no more rubber milk to be obtained in several towns (save few) through which we passed, we were obliged to give oral lessons to those interested in this industry. The Ire tree (*Kickxia africana*) is the only tree from which our present rubber supply is obtained, although in some parts about the Ekiti forests we observed other rubber-yielding trees, such as species of *Landolphia*, *Ficus*, &c.

The species of *Landolphia* yielding the soft rubber is found plentifully in the Ekiti forests, but owing to its softness, and the low prices offered by merchants, the people do not consider it remunerative enough.

The other species of *Landolphia* (probably *L. owariensis*) which produces the harder and superior rubber is much preferred, but as it is very scarce and not so common in the interior as the soft one, very few balls have been brought down and sold at very lucrative prices. During all our tour the only place where it was observed to exist (but not in a very large quantity) is in the Isoya forests. We advised them to search for this particular species, which is commonly known under the native name of Ibo Akitipa, and to collect rubber of it, which, we assured them, will be readily sold at as good a price, if not better, than that offered for the Ire rubber. The tapping of this species of *Landolphia* will not take so much time as the Ire. The operation is simple enough, and can be successfully done by intelligent and careful natives. The stem of the vine (which is as thick as a man's arm) is detached from all its supports and stretched out on the ground, but its roots are not at all disturbed, so that the vine is still supported by its roots. After stretching out the vine on the

ground, incisions of 6 in. × 2 in. are made at distances of from 6 to 8 ft. apart, under these incisions vessels are placed to receive the milk, which easily and readily coagulates, and is then balled or wound up. This kind of rubber has no water whatever in it.

The species of *Ficus* noticed are several, but owing to the insignificance and inferiority of its rubber (specimens have been sent to England and valued at a very low price) we did not recommend these to them.

On the whole we are compelled to say that the Government was rather too late in taking up this matter, and that unless our suggestions and recommendations are followed by the people we very much fear for the permanency of the rubber industry.

Rubber collectors have now to go 15 or 16 days off Ibadan for rubber beyond the Protectorate of this Colony. The countries where active rubber-working is going on are the Benin and Akoko forests. Unfortunately we could not proceed to these parts which, we understand, are outside the Protectorate of this Colony, consequently we did not go further than Owo (a place only three days off Benin) which, we understood, is the limit of our Protectorate on that side.

*   *   *   *

We have, &c.,
(Signed) F. G. R. LEIGH,
T. B. DAWODU,
Assistant Curators.

EXTRACT from LAGOS ANNUAL REPORT for 1897.

"As was anticipated, the falling off in the production of rubber, due to the reckless way in which it was collected, has come to pass, the amount shipped in 1897 being 4,458,327 lbs. as against 6,484,365 lbs. in 1896. It is early to talk pessimistically of the 'extinction of the industry,' inasmuch as the opening up of fresh country to peaceful commerce cannot fail to revive the production. At the same time the greed and guile of the small minority that collects and adulterates rubber, coupled with the apathy of the large majority that only looks on, must inevitably deal a severe blow to the trade. Steps are, however, being taken to encourage the native chiefs to have the rubber collected in a thrifty and systematic manner, which, it is hoped, will show good results in the near future" (pp. 6, 7).

DCXLII.—MADAGASCAR INDIA-RUBBER.

Enquiries are frequently made about the rubber-producing plants of Madagascar. This island has long been known to furnish a supply of india-rubber to commerce. (See *Kew Bulletin*, 1892, p. 70.) Hitherto it has been supposed to be yielded exclusively by species of *Landolphia*, the "rubber-vines" which are so widely distributed in Tropical Africa. Within the last few years it has been obtained, and apparently in abundance, from a number of other plants.

About 1892 an immense development of the rubber-trade took place in Southern Madagascar. The following account is borrowed from the *India-rubber and Gutta Percha and Electrical Trades Journal* (Nov. 3, 1893, p. 107) :—

The French Vice-Resident, writing from Nossi Vé (not to be confounded with Nossi Bé)—his report appearing in the *Moniteur Officiel du Commerce* of November 2nd—says :—" Caoutchouc has only been exploited in the southern regions since the first months of 1892, and the first operations, conducted with discretion, have given very brilliant profits ; since then the affair has been blazed abroad ; a veritable caoutchouc fever has raged with everyone, especially the natives. Everything has been neglected for the rich product, leading to great modifications in wages, in the recruitment of workers, and in the prices of food and goods, &c. But the exploitation of caoutchouc has been carried out with veritable vandalism ; the trees and shrubs producing it have been savagely destroyed ; hence the diminution in the yield, as well as in the quality, because the natives have mixed other substances with the caoutchouc to increase the size and weight of the balls."

Some further information which has attracted a good deal of attention appeared in a letter from Mr. Abraham Kingdon which appeared in the *Standard* of Dec. 22, 1896.

I call your attention to the arid district of St. Mary's, the southernmost part of Madagascar, from which district an enormous amount of india-rubber has been procured during the last few years.

The india-rubber is procured from an almost leafless shrub with a large bulbous root. The discovery that this shrub produced india-rubber was made by a "fluke." Up to the time of the discovery, india-rubber had only been procured from *Landolphia*, which grows freely in all the low-lying parts of Madagascar, north of the arid district of St. Mary's. One day, however, a young native (who did not believe that india-rubber could be procured from anything but the *Landolphia*) brought two balls of india-rubber to Mr. Marchal, of Fort Dauphin. He said, " I have brought you two balls of something which looks like india-rubber ; but I do not think it can be india-rubber, because it was not procured from the vahy *(Landolphia)* ; but if you will buy some of it I will bring it to you." He added, " I saw some boys playing with these balls. They were made from the juice of a shrub, which coagulates as soon as it is exposed to the air."

Mr. Marchal said that he was not a chemist, and as he did not know whether it would turn out right in the process of manufacture he did not care to risk much. The natives offered to sell at five dollars (one pound) per hundred lbs., and Mr. Marchal accepted the offer. The rubber was brought in such large quantities that Mr. Marchal was very soon cleared out of goods and cash, but as he had been twenty-five years a resident of Fort Dauphin, and was trusted, the natives brought him large quantities on credit. He was able to load a small barque, and took the cargo to Mauritius, where he sold his india-rubber at twenty dollars (four pounds) per hundred lbs. For about eleven months Mr. Marchal had a monopoly, and during this period he cleared

twenty-six thousand pounds net profit. The same kind of india-rubber is now sold at Fort Dauphin at forty-five and fifty dollars per hundred lbs. Unfortunately the natives destroy the shrub in the operation of collecting the india-rubber; for, in order to take the milk from the bulb, they root up the shrub.

For the most recent information Kew is indebted to the following communication from the Foreign Office :—

FOREIGN OFFICE TO ROYAL GARDENS, KEW.

SIR, Foreign Office, September 3, 1898.

I AM directed by the Secretary of State for Foreign Affairs to transmit to you the accompanying copy of an article extracted from the *Dépêche Coloniale* respecting the cultivation of India-rubber in Madagascar.

I am, &c.,

The Director, (Signed) F. H. VILLIERS.
Royal Gardens, Kew.

EXTRACT from the *Dépêche Coloniale*, August 28, 1898.

The Exploitation of India-rubber in Madagascar.

The localities favourable for the cultivation of india-rubber in Madagascar are numerous, especially on the coast and lower levels of the Island.

It may be expected that the efforts which may be made in this direction will fully succeed if, in establishing plantations, the essential conditions for producing the best india-rubbers are properly studied. The best known rubber-trees are: the *Hevea*, *Manihot*, *Castilloa*, *Landolphia*, *Willughbeia* and *Ficus*.

Besides the vines (*Landolphia*) and the Euphorbiaceæ of the south, there exists a tree met with on the east side of the Island which the natives designate *barabanja*. This tree, which furnishes an abundant and much-prized latex, appears destined to play an important role in the future. There are two varieties, the one, the most important, with large leaves, the other with small leaves. They belong to the family of the Apocynaceæ, tribe Alstonieæ.

The *barabanja* is abundant in the region comprised between Vohemar and the Bay of Antongil. The tree is found wild up to an altitude of 1,300 to 1,600 feet. It prefers the glades and borders of forests, and may attain to a height of 50 feet, with a circumference of 5 feet. Specimens of this size are, however, rare, for, about the age of eight or twelve years, the natives make excessive incisions, and very often even cut down the tree in order to gather the latex.

The tree propagates itself readily from suckers, and it is to this that the present abundance of the tree is due. Very fine specimens are reported from the neighbourhood of Antalaha, Sahambava and Soavinandriana.

The cultivation of india-rubber trees has already been tried in different parts of the Colony. The preference seems to have been given to plants of *Hevea*, from Para, which appears likely to give satisfactory results.

With regard to the production of india-rubber, certain regions of Madagascar have been specially favoured. In the province of Fort Dauphin, for example, where an increasing production has been most observed, there were only 12 to 15 tons a year of rubber taken up to 1890 from *Landolphia* vines (Vahea) and from species of *Ficus*. But the discovery of the Euphorbiaceous plant, commonly called "*intisy*," which gives a superior latex, has stimulated an important commercial movement towards this district; the harvest has been collected more energetically, and this has resulted in the zone of the rubber production being reduced to a considerable extent.

For the last few months natives of the west of the province of Fort Dauphin have begun to bring a little rubber to the coast; but a European could not at present devote himself to regularly and systematically working the substance owing to the bad state of communication in the interior of the country.

During the journey from the forest to Fort Dauphin, the caoutchouc carried on the back, in loads of 65 lbs., loses from the heat of the sun a certain part of its weight. At the present moment, the production, together with the loss and cost of transport, comes to 1·05 fcs. per lb. If to this we add the expenses of packing, carriage to the sea, shipping charges, export dues at 0·10 fcs. per lb., the total price per lb. reaches 1·25 fcs. delivered on board the vessel in the Fort Dauphin Road. From Fort Dauphin Harbour alone there were exported in—

1896	167,857 kilos.	(369,285 lbs.)
1897	64,222 ,,	(141,288 ,,)

In the province of Majunga, the india rubber is one of the articles of export which occupy the largest place in the local commerce, and its importance increases each day. The rubber at Majunga comes from Morarano for the most part, from the bay of Mahajamba, from Namakia, Soalala, Marambitsy, and especially Maintirano and Morondava. Generally the rubbers from the west coast are produced from "vines," which the natives incise without any care, cutting even the roots in order to obtain the largest amount of sap. The most sought after is the "pink rubber," but one also finds the "*ambongo*," "*godroa*" and "*vea*." In the north the caoutchouc is generally prepared by the natives with sulphuric acid, lemon, salt, or juice of the tamarind; in the south, on the contrary, it is coagulated with salt only. The value of the latter in commerce is inferior to that of the north.

Rubber prepared with sulphuric acid is worth at the moment from 350 fcs. to 360 per 100 kilos. (220 lbs.), whilst other rubbers hardly fetch 300 fcs. per 100 kilos.

There were exported—

From Majunga, in 1896, 19,445 kilos.; in 1897, 41,448 kilos.
From Nossi Bé, in 1896, 11,340 kilos.; in 1897, 40,766 kilos.
From Nossi Vé, in 1896, 122,313 kilos.; in 1897, 122,129 kilos.

As soon as roads become more numerous in Madagascar, the colonists who wish to devote themselves to a rational cultivation and working of rubber will obtain good results; but they must act with judgment, and not take from the plant more latex than it can reasonably produce.

The botanical identity of the Madagascar rubber-yielding plants is obscure. It is much to be regretted that the French botanists do not investigate it and clear it up.

M. Henri Jumelle has devoted a chapter to the subject in his "*Les Plantes à Caoutchouc et à Gutta dans les Colonies Françaises*," pp. 104–116 (1898). Of the "vines" he states that the most valuable is the Vahy (*Landolphia madagascariensis*). Other forms of the native name are no doubt the Vahea and Vea mentioned above. It appears to yield "pink rubber."

Intisy is a small leafless Euphorbiaceous tree. It is certainly the shrub described by Mr. Kingdon. What he terms the "large bulbous root" is probably the fleshy stem.

Little appears to be known about the *barabanja* except that it is a tree of fifty feet in height. It may be conjectured that it is an undescribed *Tabernæmontana*.

The late M. Raoul sent to Kew a specimen of what he described as the "best rubber-yielding plant in South Madagascar," which appeared to be a new species of that genus, or possibly a *Mascarenhasia*.

The *Godroa* is a small tree, perhaps also Apocynaceous.

DCXLIII.—SKIRRET.

(*Sium Sisarum*, Linn.)

Enquiries have been addressed to Kew as to the cultivation in China and Japan, for the manufacture of sugar, of the skirret (*Sium Sisarum*).

The skirret, which was commonly grown as a vegetable in Europe in the sixteenth and seventeenth centuries, is now but rarely to be seen, the potato having in a very large measure replaced it, and contributed chiefly to its neglect. It is a member of the Natural Order *Umbelliferæ*. Each plant produces a number of esculent roots, like crooked and knotty fingers; these, as those of the related parsnip and carrot, possess a sweet taste, to which is added a slight flavour suggesting another allied plant, the celery.

Sugar, which gives this sweetness to the skirret, occurs in the roots of other species of *Sium*. *S. Ninsi*, a plant found in Japan, has sweet roots used medicinally, and the roots of *S. latifolium* of Europe and North America contain much sugar, here associated with a poisonous resin (see Porter in *Pharmaceutical Journal*, ser. 3, vii., p. 174).

The sweetness of the roots of *Sium Sisarum* has obtained for this plant a German name literally meaning "sugar-root," and suggested to Marggraf that sugar might be extracted from them.

Marggraf's name is well known in connection with the Beet-sugar industry, for his investigations, published in 1747 (*Histoire de l'Académie Royale des Sciences de Berlin*, 1747, p. 79), were the first to show that other plants besides the sugar-cane might profitably yield sugar. The white beet, the red beet and the skirret gave him in these first experiments "a sugar resembling

the best yellowish St. Thomas, known as Moscovade." He extracted sugar by two processes: the first consisted in drying the roots and powdering them, and then extracting with alcohol; by which method he obtained from ½ lb. of dried white beet 4 drachms of sugar, from the same weight of skirret 3 drachms, and from red beet 2½ drachms. Some sugar, he remarks, was lost. A second and cheaper process by expression was tried, and sugar such as described above produced; after obtaining the sugar from the skirret roots he allowed the liquor left to ferment, getting an alcohol; and by allowing the starch to settle he obtained a powder, such as was then used for powdering the hair.

Marggraf recognised that the white beet gave more sugar than tke skirret, but the skirret more than the red beet. From the parsnip and the wild carrot he failed to obtain sugar. When, in 1799, Achard, at the request of the Prussian Government, repeated Marggraf's work, it was with the white beet that he experimented, laying thereby the practical foundation of the modern industry.

Two analyses of skirret roots have been made. Parmentier (fide D'Orbigny, *Dictionnaire d'Histoire naturelle*, "*Sium*") obtained 8 per cent. of sugar; Sacc (*Bulletin de la Société d'Acclimatation*, ii., 1855, p. 561) obtained 6·6 per cent. Sacc's analysis gave the following results:—

	In 100 parts.
Water	62·41
Fibre and Ash	7·91
Starch	18·09
Cane-sugar	6·60
Proteids	2·09
Soluble salts	1·37
Pectic acid	1·00
Gum	0·53

Sacc advocated the cultivation of the plant. He obtained roots weighing ½ lb. to 3¾ lbs., the average being a little below 1¾ lbs. As calculated (Dupuis, *Revue Horticole*, sér. iv., v., p. 305), this yield should give 76 tons to the acre; but, as Sacc's plants were grown in very favourable conditions, such an amount is probably considerably above what may be expected.

The skirret is steadily going out of cultivation. In Great Britain, under the name of "crummock," it persisted in the extreme north of Scotland, after ceasing to be grown in England. In Scandinavia Schuebeler (*Die Pflanzenwelt Norwegens*, Christiania, 1873–5, p. 280) says that he had only seen it near Christiania, and that sparingly. In France, as Paillieux and Bois, authors of *Potager d'un curieux* tell us, in the north and about Paris skirret is only known as a name, and M. H. L. de Vilmorin writes that he is not aware that it is grown for market anywhere in France, but that it may be found in old-fashioned gardens, chiefly in the west and south of France from Tours to Nîmes and Avignon. In Germany and Austria it seems to be but little cultivated, the seed to maintain it in the few gardens, where it now exists, being, according to Herr Ludwig Möller, imported yearly from France.

Thus is the vegetable which in 1682 was said to be "the sweetest, whitest, and most pleasant of roots" (Worlidge, *Systema Horticulturæ*, p. 185) fast disappearing from gardens.

The history of its introduction into cultivation is very obscure. It is commonly stated that it came from China, but this is probably incorrect. No one except Loureiro pretends to have seen Chinese specimens, and there is reason to think that this botanist, when he stated that it was cultivated in Cochin-China and China, was in error. One botanist only, Thunberg, has obtained it in Japan, and then apparently as a cultivated plant. Maximowicz (*Mélanges biologiques*, ix., decas xiii., p. 17) accepts it as wild in the Altai Mountains and Northern Persia.

To Marco Polo has been attributed the credit of bringing it from Central Asia to Europe, but without sufficient evidence.

More recently Rostafinski (*Botanisches Centralblatt*, 25, p. 40) has given reason for thinking that, besides inhabiting Central Asia, it occurs wild in Podolia and Volhynia in S.W. Russia. From this region, he thinks, it was introduced into Germany by some embassy, as early almost as the Norman conquest of England. There is no great improbability about this. Certainly, of the names applied to it in various European languages, all, with two exceptions, appear akin to its German names, and may well be the result of carrying those names with it as it travelled from a German starting-point. This idea of a German centre of dispersal is very greatly supported by such statements as that of Olivier des Serres (1600), that the skirret came into France from Germany, and that of Simon Sirenius (1613), who, according to Rostafinski, says that it was introduced into Galicia from Maintz.

Summing up the evidence, which language affords, upon the migration of the skirret, we commence with an old German name "Gerle" or "Girel," used, according to Rostafinski, in 1160. This transferred to the French language has become "Girole," and by the addition of moren (Möhre = a carrot, *i.e.* esculent root) became "Gritzelmören" in Hesse, and "Kritzelmore" or "Krotzelmore" in other parts of the German Empire. Thence it is easy to trace the Polish "Krucmorka" or "Kucmerka," and the Russian "Kuczmerka." The Germans, however, originated, amongst others, a descriptive name, "Zuckerwurzel," and this gave rise, it seems, directly or indirectly to the Danish "Sokerot," the Dutch "Suikerwortel," and our English "Skirwort" or "Skirret"; and yet a second complication arose by the transference in France of "Chervis," from a native plant to the incoming Skirret. From this second French name would come the Spanish "Chirivia." Thus have we three sets of names; the first derived from Girel, and common to the Russian, Polish, German, and French languages; the second unmistakably of German origin, and common to the Anglo-Saxon races; the third apparently of French origin, and common to French and Spanish. Without dragging this form of evidence into too great prominence, we may still see in it some indication of the way in which the plant under discussion has wandered through Europe. The least widely spread names are likely to be the most modern, and the most obscure in meaning and cause of application the most ancient. And thus this points towards a German centre of dispersal.

Whether the French word "Berle" has any common origin with "Gerle" does not seem to have been discussed; nor has the origin of the Scotch word "Crummock" been clearly traced.

Some writers have thought with the early botanists, such as Fuchsius and Mattioli, that the Romans grew this plant. But if of Podolian and Asiatic origin, and introduced to Germany about 1100 A.D., then the "Siler" which served the Romans as a vegetable, and a superior form of which the Emperor Tiberius caused to be brought as an annual tribute from the Rhine (Pliny, *Historiæ Naturalis liber* xix., cap. 5), is not the skirret; and, indeed, the statement that the roots needed dishing up with honey to counteract their bitter taste almost proves this. Neither Columella's nor Pliny's plant appears to be *Sium Sisarum.*

England and France do not seem to have received the skirret until the sixteenth century, but once introduced into these countries it was for more than a century in considerable favour either fried or boiled, or as a salad with *Myrrhis odorata.* It also seems to have had a medicinal use, just as *Sium Ninsi* is said to have in the far East, as *S. nodiflorum* formerly had in the London Pharmacopœia, and as *S. latifolium* in France.

Linnaeus tells us how every German garden in his day contained it; but, as we have seen, this country, which appears to have distributed it to Western Europe, now hardly grows it.

DCXLIV.—CACAO IN ECUADOR.

Kew is indebted to a correspondent for the following interesting account of the production of Cacao in Ecuador. The particulars given with respect to Cacao blanco (*Theobroma bicolor)* are interesting, for though it has not found its way into commerce, the richness of the beans in fat may some day lead to their being turned to account. Trees have produced pods in the Botanic Gardens at Trinidad, and plants have been reared from the seeds.

SÑR. J. V. SIGVALD MÜLLER to ROYAL GARDENS, KEW.

c/o Sucesores de Rafael Valdez,
Guayaquil, Ecuador,
September 17, 1898.

DEAR SIR,

By sample post I forward to-day beans of Cacao Machala (fine) and of Cacao blanco, which also comes from Machala on the coast south here.

1. Guayaquil will this year export above 3,500,000 lbs. of Cacao, which makes 200,000 bags.

2. All Cacao is divided here into "Arriba," which means "above" Guayaquil (Cacao that comes down the river, and which always is the best and most valuable) and into Cacao Balao and Machala, named after two ports along the coast south of the River Guayas (on which Guayaquil is placed).

3. To kill the seed (the peculiar Cacao flavour being at the same time developed) the beans are allowed to ferment. For "Arriba" this is done with great care, and sometimes three to four days are used in the process. But it is said that only one day is often used for the Cacao shipped from Balao and Machala. Anyhow, it is the

fermenting—which some German writer has called the rotting process—that kills the seeds and develops the colour which the nibs show when the seeds or beans are sliced lengthways. The colour should be chocolate brown and perfectly even. Badly fermented beans show the cotyledons greenish or bluish in part.

If the seeds are not fermented, they will sprout in the sacks and destroy everything. It seems that the southern growers only think about getting the vitality destroyed, while the "Arriba" planters take very great care while doing so.

4. The harvest is over with the end of July, but that is only the main crop. All the year round the gathering of the fruits goes on, but only the top price is locally attained for the main crop. Then "Arriba" is \$2 to \$3 above Balao and Machala, and not only \$1 (equal 25d.), as now, between the three sorts. In September last Cacao Arriba stood at \$29, Balao at \$28, and Machala at \$27 per arroba of 100 Spanish (equal 101½ English pounds about). (In this land of the metre, Spanish lbs. and English two-foot rules and Spanish leagues are really in use, the yard being "una rara.')

5. Just below the foot of the western slopes of the Western Cordilleras of Los Andes, the Cacao grows wild in dense bush. Monkeys are known to have enlarged such natural gathering grounds or formed new ones near them. The tree is inclined to grow with many stems, but to be productive the stems are here reduced to two or three. When planted they must have some shade trees or bananas among them, but otherwise they are left to themselves, except as to cutting out stems. In Trinidad (exporting about half against Ecuador) the trees are topped and kept low and wide apart.

6. There is no doubt the whole Guayaquil crop of red Cacao comes from one species, and this is the same that is found here and there planted in Bahia and Rio de Janeiro. In Esmeraldas (North Ecuador) there is at least one other variety, with short or nearly roundish fruits, but I have never succeeded in getting specimens. The beans are sold with those of the common one. The drawing of leaf and flowers and fruits in Treasury of Botany exactly represents the Ecuadorean or Guayaquil Cacao-tree (but the bean is oval).

7. The sample of "Machala" Cacao forwarded is so good in quality that it nearly comes up to "Arriba," which also proves that it originates from the same tree. Fine "Arriba" is nearly bright red. General "Machala" and inferior "Arriba" dark brown to very dark umber. (The beans are finally dried here on the streets or quays along the river).

The Cacao grows only successfully on certain stretches of the immense delta of the River Guayas and the more southern rivers. It requires an alluvial yellow loam as a subsoil, as far as I can see. Where grass will grow Cacao will not be a success. It is a forest tree from the moist (but not generally flooded) borders of great rivers under the tropics. The plantations on the Cacao estates are in larger or smaller patches.

The "Arriba" Cacao comes mostly from the province "Los Rios," Guayaquil being in the Province "Guayas," and Los Rios being the delta higher up, before the main river Guayas is formed.

Whether the original home of the Cacao-tree is the Amazon Valley or Ecuador, from Esmeraldas to the arid coast of Peru, is a question. There are two Cordilleras with "Paramos," or snow summits (Paramos=grass-grown and above tree-level, say 10,000 feet), and the temperate Andean valley separating the two districts; the Amazon delta has only been civilized in part in our days, and there is no great export from that side. I should say that Ecuador is the original home, and that the seeds have been carried across eastwards and thus into the Orinoco delta and on to Trinidad, etc.; Caracas being a centre, the one nearest to Guayaquil.

8. Altogether, when looking into these questions, it must be borne in mind that Peru of the botanists is the present Ecuador, and that the Spaniards, unlike the Portuguese Brazilians, never cared for anything but silver and gold, left botany quite alone, and neither knew nor adopted native names, and that in a land where every locality among the natives takes its name from a tree or plant, as Sigsigbamha (Sigsig=a flowering reed, if I remember rightly; Bamha=a plain).

9. Amongst the Cacao from Machala comes what is called "Cacao blanco" (*Theobroma bicolor*). It is very rare among the "Arriba." The seeds or beans are very similar and the pod somewhat similar, but the leaf is different. The cotyledons of "Cacao blanco" are white, and when fresh taste like an almond, and are very oily. These seeds are, as far as possible, picked out from the real Cacao seeds if intended for the general European market. There is an additional reason for this. Neither rats or other animals eat the Cacao bean, as far as I know, but rats are very eager to get at the "Cacao blanco" bean, and will destroy a sack to get at a single bean. But in Spain, and I suppose in Mexico, an oily chocolate, that is, with as much Cacao butter as possible, is considered the best. Therefore for the Spanish market an admixture of this so-called white Cacao (I do not believe that it ever is above 1 per cent.) is not objected to on account of the abundant oil in the bean. Whether the admixture of this spurious Cacao tree in the southern plantations is the result of negligence or ignorance, or whether it has been made to meet the Spanish taste, I have not as yet formed an opinion, but the "Arriba" plantations, where it is very rare, are modern. When Quito was first occupied by the Shirris, a coast tribe from Puna (the island in the Gulf of Guayas) perhaps, they got to Quito from Bahia (not the Brazilian de San Salvador), due west of Quito. De la Condamine in 1738 went also from Guayaquil up the coast, and, I believe, as far as I can understand it, got to Quito by the track from Esmeraldas, which he struck coming from Bahia. The present route *viâ* Los Rios (called *viâ* Bahahay) was made use of by his companions who had preceded him, but the delta must then hardly have been fit for cultivation of any sort.

Anyhow, the "Cacao blanco" cannot be indigenous to that present great centre for the cultivation of Cacao. As far as I know, the "Cacao blanco" is never shipped by itself. The workmen and employés eat most of them.

The Cacao comes to Guayaquil taken out of the pods and fermented and partly dried. This last is better done in Guayaquil,

which for months has no rain at all. As it comes down it is mixed with branched remnants of the arils. These are picked out and used for horse fodder ; they are very much relished by the horses and mules. These arils are one of the perquisites of the ganger for the men cleaning and sacking the Cacao.

Yours truly,
(Signed) J. V. Sigvald Müller

The Director,
Royal Gardens, Kew.

DCXLV.—IMPROVEMENT OF SUGAR-CANE BY CHEMICAL SELECTION.

In the *Kew Bulletin* for 1894 (pp. 86–96), 1897 (p. 318), and 1898 (pp. 331–334), account was given of the method pursued at Calumet Plantation, Louisiana, and subsequently in Queensland and Barbados, of improving the sugar-cane by chemical selection. This is based on the known variability of cultivated plants and the consequent possibility of enhancing any desired character by the continued selection of the plants in which that character is most marked.

As long ago as 1886 it had been pointed out in a letter to the Colonial Office from Kew that the saccharine contents of the sugar-cane could be improved by progressive selection quite independently of reproduction by seed.

Mr. Bovell's results at Barbados have attracted the attention of Dr. Kobus, the Director of the Sugar-cane Experiment Station in East Java. He has lately favoured us with the following interesting letter, which is printed for the information of those working on the subject :—

Director, Sugar-Cane Experiment Station, East Java, to Royal Gardens, Kew.

Pasoeroean, March 26, 1899.

Dear Sir,

In the " Report of the results obtained on the experimental fields at Dodd's Reformatory, 1897," I see that you suggested to Mr. Bovell to try the selection of sugar-cane by chemical analysis of the juice.

Nearly three years ago I proposed the same to the principals of the experimental station at Pasoeroean. As I myself was appointed Director in the same year, I commenced after my return from Europe in May, 1897, with the analysis of nearly 6,000 canes and cane-clumps, and found that the available sugar in canes of the same age varied by as much as 2 per cent. At the same time I showed that canes grown from the same cutting and of nearly the same age might show a difference in available sugar of from 7 to $8\frac{1}{2}$ per cent. I concluded therefrom that it was not advisable to select individual canes, but that it was necessary to select cane-clumps. When the juice of a whole cane-clump, except the tops, has a great amount of available sugar

every cane of the clump must have it also, and the chance that its descendants are rich in sugar is greater than when some canes are very rich and others of the same clump are very poor, and the cuttings of these rich canes used for selection. After I had arrived at this conclusion, I analysed 5,000 cane-clumps belonging to five varieties, and selected 10 per cent of the highest and 10 per cent. of the lowest polarizing plants. I had the pleasure to send you the pamphlet No. 41 with the results of the analyses in October, 1897.

Since then I have reaped the canes grown from these cuttings, and found that the descendants of the rich canes contained $1\frac{1}{2}$ per cent. more available sugar than the descendants of the poor canes (average of 3,200 analyses). I was astonished to find that the rich canes' descendants were heavier than the descendants of the poor canes.

I continued the selection with canes from other varieties or other fields (5,700 analyses), and found as a general rule that the rich canes were the heaviest, and also that the heaviest canes were the richest in available sugar. I concluded from this that both a high content of available sugar and a heavy weight are inherited by the descendants.

The results of these investigations I had the pleasure to send you in August, 1898 (Pamphlet No. 3, Third Series). The sugar estates who pay the expenses of our experiment station have granted me £500 to continue the selection on a larger scale, and placed at my disposal a cane-field of about 30 acres. Herefrom I selected 30,000 kgs. rich canes and 10,000 kgs. poor canes for cuttings, and these showed again the same properties.

I mention these investigations which, perhaps, escaped your attention, as the pamphlets are written in Dutch. But you would find them worth making known to sugar growers in the West Indies.

I am, &c.,
(Signed) J. D. KOBUS.

The Director,
Royal Gardens, Kew.

DCXLVI.—A BUDGET FROM YUNNAN—continued.

The following letters are in continuation of those printed in the *Kew Bulletin* for 1898, pp. 289–297 :—

EXTRACT from letter from Dr. A. Henry, F.L.S., to Royal Gardens, Kew, dated Szemao, par Laokay, Tongking, November 29, 1898.

Collecting goes on apace ; and I think the Szemao collection will fully equal that of Mengtze, and it will be considerably different, wonderfully so when one considers that the two places are on the same parallel, at no great distance—200 miles say. The great bulk of the plants are different, *i.e.*, of individuals (of course, many species are common). Here the dry forests of *Quercus* (6–10 species), *Castanopsis* (3 spp.), *Schima Wallichii*, *Helicia*

(3 spp.), *Anneslea*, are quite strange to one coming from Mengtze. I have just found *Quercus lamellosa*, a splendid tree, with enormous beautiful acorns and very pretty foliage. The seeds of the *Castanopsis* are edible, fairly so, and I daresay if as much attention had been paid to them as to *Castanea*, some nice fruits would have been evolved. One has tiny little seeds, but a shake of the tree brings the seeds down in hundreds, and the small boys are provided with a mallet for this purpose. I came across a fine *Buddleia* the other day (of which you have specimens from Mengtze). It has very thick coriaceous leaves, covered with white down underneath ; and, growing as it does in masses on the highest parts of the mountains, it is very effective. The curious *Pyrus Delavayi* is very common here, and occurs also high up. It has large fruits, very like an apple, and fairly edible ; indeed, it is the best wild *Pyrus* I have tasted. The ovules are four in each cell, thus establishing a passage to the quince. Of these last two I must send seeds.

The prettiest shrubs just now are three species of *Desmodium*, which are new to me. The *Cyrtandreæ* are numerous, and quite distinct from those of Mengtze. Of one lovely little one, with orange flowers, I have obtained a lot of seed. The natural orders here are represented very peculiarly. I haven't seen a Crucifer ; and *Compositæ* will, I think, rank in number of species quite below many orders. One, a *Vernonia*, is a good-sized tree. *Ficus*, of course, is strongly represented, and in every kind of habit. One has the inflorescences borne on long branches which start from the root and lower part of the branch and stretch over the ground for 20, 30, or more feet. I haven't seen a rose, but, as usual, I have two or three very new-looking *Rubi*. *Ardisia* is very largely represented ; and, very curiously, all occur together, *i.e.*, all in ravines, and they flower very nearly at the same time ; so there does not seem to be any competition amongst them. They are very pretty in flower, and the fruits remain on for several months, red or black, as the case may be.

Just now the most noteworthy thing is the occurrence of so many kinds of white berries of a consistency like jelly. This is common in *Cyrtandreæ*, certain *Rubiaceæ*, and even the nutlets of some woody *Labiatæ* are of this curious appearance, not to speak of *Mæsa*, *Chloranthus*, &c. None of these occurred at Mengtze, so far as I saw, although, of course, some were collected for me in the more distant mountains. *Rhododendron* only two species, but very beautiful shrubs.

By a glance at the newly-described ferns you will see that quite a number came from Mi-Le, which is considerably north of Mengtze ; and I think the north-east of Yunnan and Kweichow will turn out astonishingly rich in new plants, and it is there rather than here in the south that new generic types will be found. My trip in the mountains north of Ichang showed the possibilities of Central China ; and the trip was, as it were, a mere scratch of an exploration. Hundreds of such trips can be made in Szechwan, Hupeh, Kweichow, and Shensi, and you may quote this opinion to people who wish to get out the seed-collecting expedition I advocated. In fact, until the great region north-east, as it were, of the Himalayas is explored, people

will have no idea of the richness of the world in beautiful plants. I look upon this region as the central point from which the Temperate Flora has originated, or has been broken up into numberless species.

I note what you say about fluviatile shrubs; but here I am quite confined to my office and cannot get away on trips, and so I am unable to make observations in quantity. I am also spending a lot of time at the study of the Lolo language, as I think it a pity to leave such an interesting field unexplored. I have completed a good-sized dictionary, and translated a number of booklets. There is much to be done here in the study of living plants, but, alas! I haven't the time. I am dependent, indeed, for the great richness of my collections in a large measure on the excellent native, old Ho, who is working for me here as he did at Mengtze. The handling of the collections, labelling, packing, keeping free from insects and mould takes up a good deal of time indeed. My Yunnan numbers now reach 3,700, *i.e.*, 1,200 new ones since the Mengtze collection. I scarcely find the immediate surroundings so interesting as Mengtze, as the forests are very uniform, and high mountains don't occur. I hope that the turn of the Service wheel may despatch me to Teng-Yueh when a Custom House is established there. A little more north there are higher mountains, and I think there would be quite a new flora there, judging from the way in which the flora changes as one goes westward from Kwangsi to Mengtze, and from Mengtze to Szemao. I am packing up with the Szemao set a number of plants sent me from Lungchow by Mr. Morse; but two packets of duplicates and other plants sent by him were destroyed by fire in the summer at Manhao; a very annoying accident. He found *Lysidice rhodostegia*, Hance, which is a wonderfully beautiful tree.

I hope you will succeed in growing San-ch'i. It should be tried in the shade; and transplanting will be of benefit, as this is done by the cultivators. This plant is mainly cultivated by the Yao aborigines who live in the mountains from Kwangsi east to near here. These people are a race sub-genus. The men are excellent sportsmen, and dress in a very neat Tyrolean sort of attire. They move about in the mountains from place to place, opening up new clearings in the forest, and are much addicted to little cultures, such as of indigo, San-ch'i, &c. Their language is unlike that of any of the other aborigines; and they merit a study.

I am too far north for Benzoin. You ought to write in connection with it to the Consul of Chiengmai, in Siam.

EXTRACT from letter from Dr. A. Henry, F.L.S., to Royal Gardens, Kew, dated Szemao, par Laokay, Tongking, December 20, 1898.

Collecting still goes on, and I have two boxes of Szemao plants ready for Kew. There will be quite a large number of plants hitherto supposed to be Indian only. I have just found *Clematis*

smilacifolia, which is a very grand plant indeed. There is coming into flower now in the shade of the woods an *Edgeworthia*, which, I think, is new, as the leaves are glabrous and are also persistent. Like most of the plants which grow in shade only, the flowers are white. As at Mengtze, this is the best season for plant collecting; the weather is beautifully dry, and there are almost as many plants in flower now as in the spring, *i.e.*, in the forests. In the dry, exposed hills the grass is withered brown, and there is some appearance of winter effects; but in the protection of the ravines there is, as it were, spring. The temperature this morning was 4° C. only.

You remarked in your last letter that the Ginseng plant did not succeed with you. You ought to try in the case of the San-ch'i the native method of culture, which is, sowing under low sheds over which leaves are spread as a roof, so that the plants only get a glimmering light. After the first year the plants are always transplanted, and still kept growing under the sheds just mentioned. In a similar way *Coptis Teeta* is cultivated. These plants cannot apparently bear any direct sunlight.

Some of Morse's Lungchow plants will go forward with my next lot. He found *Lysidice*, a remarkable Cæsalpiniacea, which must be a wondrously beautiful tree, also a species of *Aspidopterys*, a Malpighiaceous genus not hitherto recorded from China, etc. He is now at Pakhoi, and I hope to receive some plants from there from him.

I hope the revolving wheel of the Service may send me to Teng-Yueh when that place has a Custom House, as in that vicinity there are high mountains, and there would be a chance of rivalling Delavay's collections from the mountains near Tali. I am, of course, satisfied with Szemao, as it is really very interesting in many ways; but I cannot get away on trips, and my short excursions are limited to forests which are very uniform in character. And in a mountainous country one likes to have two or three distinct floras to work in.

My Lolo studies are going on. I have found out many curious things in their writings. The occurrence of Taboo is interesting, I think—in the way it occurs. Each surname, as a rule, signifies a tree or animal name, and the bearers of the surname can't touch in any way the tree or animal belonging to them. This tree or animal is, however, not considered sacred or an object of worship. Diseases are—nearly all—explained as the visitation of evil spirits, or the meeting with unlucky omens, though omen is not the word which expresses the thing exactly. This thing—an unlucky omen—*Slo-ta* in Lolo, is some uncanny occurrence. A cow, *e.g.*, getting on the roof of a house is sure to bring trouble in the way of illness; and the *slo-ta* here concerned must be averted by reading an appropriate ritual.

The Lolos have a rigid enough set of morals; but they are entirely devoid, I think, of the idea of *sin*. They are very severe on theft, and a man, *e.g.*, cutting down a tree which blocks the path is considered to do wrong, but a man getting drunk, that is not considered a wrong. In other words, they have the conception of wrongs, done by one person to another—infractions against

tribal rules, &c.—but of sin in the individual, hurting the individual himself, there is no trace, I think. Nor can I find any idea of sin as an offence against spirits or gods. There are good and bad spirits—but they all seem really to be obnoxious, *i.e.*, causing disease and calamity; and they are worshipped by sacrifice and ritual, or by sacrifice and exorcism (a more suitable term, perhaps).

Here the Buddhist doctrine of transmigration and a Hades has affected the Lolos; but one can see it is a late introduction and has no bearing on their lives. They have no idols; and their only priests are the Pê-mo or Exorcists, who are such in virtue of the fact that they can read the appropriate rituals, *i.e.*, Pê-mo = priest = exorcist = literatus. The priest and the scholar are not as yet differentiated. Witches, of course, occur. They have also an ordeal which is curious. It is also very difficult to account for their legends of the deluge, of Cyclopean men with one eye, &c.

DCXLVII.—MISCELLANEOUS NOTES.

Mr. Isaac Henry Burkill, M.A., late Temporary Assistant in the Herbarium of the Royal Gardens, has been appointed Principal Assistant in the Director's Office. Mr. Burkill was a scholar of Gonville and Caius College, Cambridge, and Assistant Curator of the University Herbarium. He received the Walsingham medal in 1894.

Mr. Henry Harold Welch Pearson has been appointed by the Secretary of State for India in Council, Assistant (for India) in the Herbarium of the Royal Gardens, in succession to Dr. Stapf, promoted to be a Principal Assistant. Mr. Pearson was Assistant Curator of the University Herbarium, Cambridge, Frank Smart Student, Gonville and Caius College, and, as Wort's Travelling Student, visited Ceylon in 1897.

Mr. Thomas William Brown, a member of the Gardening Staff of the Royal Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Acting Curator of the Botanic Station at Aburi, Gold Coast, during the absence on leave of the Curator, Mr. W. H. Johnson.

Mr. J. R. Wigman, son of the Curator of the Botanic Gardens, Buitenzorg, Java, entered Kew for a course of training in 1894–5, and has been appointed Curator of the Botanic Gardens, Paramaribo, in Dutch Guiana. He writes:—"I am forming the garden on the site of an abandoned sugar plantation, half an

hour's walk from Paramaribo. It is almost overgrown again with forest, and it lies so low that it gets flooded during the rains. I am at present occupied in clearing and draining, making roads of the felled trees, and opening ditches to carry off the water. Along the roads I am planting *Cassia florida*, *Peltophorum arboreum*, *Albizzia moluccana*, and *Eucalyptus alba*."

Botanical Magazine for February.—*Gentiana Burseri* is a robust species with dull yellow flowers marked with small black spots. It is a native of the Pyrenees and Western Alps, and is closely allied to *G. punctata*. The specimen figured was sent to Kew by the Rev. Canon C. J. Parker, of Upton Cheyney, Bristol. *Elæagnus macrophylla*, native of Japan and Formosa, is noteworthy chiefly on account of its bright rose-red fruits, which mature in May. The drawing was made from a specimen received from Messrs. Veitch's Coombe Wood Nurseries. The pretty Burmese *Dendrobium capillipes* was sent to Kew more than a quarter of a century ago by the late Rev. C. Parish. *Ceanothus integerrimus*, from California, is an ornamental shrub with small white or pale-blue flowers crowded together in a large terminal panicle. The species has been in cultivation at Kew for many years. *Epilobium obcordatum*, also from California, is a beautiful plant for the rock-garden. It grows about 8 inches high and bears rather large, bright rose-coloured flowers, in the axils of the upper leaves. A living plant was sent to Kew by H. Selfe Leonard, Esq., of Hitherbury, Guildford, in 1894.

Botanical Magazine for March.—*Dryandra calophylla* is a dwarf shrubby plant, resembling some of the species of *Banksia*, to which genus *Dryandra* is closely related. All the species of *Dryandra* are endemic to Western Australia, the one figured being from King George's Sound, whence seeds were obtained by Messrs. Veitch, of Chelsea, who communicated them to Kew in 1893. *Passiflora pruinosa* is a handsome new species from British Guiana. The plant which furnished the specimen drawn was raised from seed received from Everard F. im Thurn, Esq., C.M.G., in 1897. *Kniphofia Tuckii* is a distinct species from Cape Colony, whence it was introduced into cultivation by Mr. Max Leichtlin, of Baden-Baden. The Kew plant was obtained from the Cambridge Botanic Garden in 1897, and flowered for the first time in the Temperate House in April, 1898. *Gynopleura humilis* is an interesting annual belonging to the Passifloraceæ. Seeds were sent to Kew from the Botanic Gardens of Santiago, in Chili, of which country the species is a native. *Rosa acicularis*, var. *nipponensis*, has solitary flowers with long narrow calyx lobes, which eventually converge and surmount the mature fruit, and deep rose-coloured petals. The variety differs from the type in having glandular prickles on the young branches and peduncles. Seeds were received from the Botanic Garden, Copenhagen, in 1894, from which the plant figured was raised.

Karoo plants.—Visitors to No. VII. House at Kew, which is mainly devoted to South African species, will have noticed a collection of plants of the most singular aspect. Nature seems to have aimed, and with entire success, at obtaining the maximum of bulk with the minimum of surface from which water could be lost. They are natives of the Karoo, the singular district which forms "a vast shallow basin" from 1,800 to 2,500 feet, north of the Zwarteberg. Kew is indebted for them to the unceasing generosity of its old correspondent, Professor MacOwan, F.L.S., the Government Botanist of Cape Colony. The following interesting letter relates to some recent contributions of peculiar interest :—

PROFESSOR MACOWAN to ROYAL GARDENS, KEW.

Matjesfontein,
October 5, 1898.

MY DEAR FRIEND,

BY way of rustication, I find myself for a few days here in the Karoo, a dry and thirsty land where no water is, unless you pump it up from the bowels of the earth. There has, therefore, been opportunity to find for you the *Crassula pyramidalis*, for which you were sighing in a not very ancient letter. Being taken up in a very dry time, and after the flowering season, there is all the better chance of the specimens sent reaching you in condition. I have found in practice at the Botanic Garden that every plant which we succeeded in flowering invariably died off after that piece of physiologic work. Hence it will be well to give your trouble to the smaller specimens, and not to bother about the few sent with the dry flower-heads still adhering to the stem apex. With these are a good many of the common and uncommon objects of the Karoo : two species of *Pelargonium* of the humpty-dumpty sort, and another, not previously seen by me, with a string of succulent stem-joints, large white stipules and pale creamy yellowish-white flowers—a pretty little thing.

Euphorbia Hystrix is here—a very comical plant. When the tufts are elliptical in shape it looks exactly like a great green hedge-hog, more like that evil beast than like the legitimate yzer-vark, "iron-pig," or porcupine, after which it gets its specific name. There seems to be an underground common stem, or caudex, from which, by copious branching, all these closely huddled ramuli take their rise. The plant I gathered among the rocks above Wapperthal for *E. Hystrix* differed from this, in that the caudex was distinctly above ground. Perhaps it may be another species, but if it were buried three-quarters under ground it would present exactly the above hedge-hog aspect. I have some 25 ramuli of the Matjesfontein one, ready for exsiccation when I return to town. The *Arthrothamnus* section of *Euphorbia* should be cultivated so as to have them properly described, when ? when you get to them. They cannot be described from exsiccata. Moreover, the Ecklon and Zeyher exsiccata of *Euphorbia* that I have are too bad for words. I send one common species, which I got out, in such condition that I think it may survive the travel home. Some others, great fleshy fellows, are far too big for sending in this little parcel way. The worst of it is, they alter incredibly in aspect when cultivated in the damper atmosphere

of Cape Town. A plant with thick corpulent fleshy ramuli will, in culture, make a perfect fool of itself on starting growth after a year's stay in Cape Town, and, instead of keeping to the old chubby pattern, slims off, which is distinctly unfair to the adoptive horticultural father who has maintained him. Some figures of *E. Caput-Medusæ* in English works, and elsewhere, are vitiated thus; they make us Capensians laugh.

I hope you will be able to read this. It is written with an aged pen, which seems to have seen years of service in the Karoo, and ink made seemingly of equal parts of black lead and sour beer.

Now I must give over; the pen is restive.

Faithfully,
(Signed) P. MACOWAN.

Medallion of Sir Joseph Hooker.—An addition to the large collection of portraits of eminent botanists and travellers has recently been made by the kind consideration of the President and Council of the Linnean Society of London, who have presented a framed cast in bronze of the original model of Sir Joseph Hooker, G.C.S.I., C.B., P.-P.R.S., executed by Mr. Frank Bowcher. It is an excellent portrait of Sir Joseph at the age of 80, and records the completion of the "Flora of British India" and of a period of sixty years service to science. It has been placed in the Museum.

A gold medal, specially struck for the occasion for which the medallion was designed, was presented to Sir Joseph Hooker at the Anniversary Meeting of the Linnean Society on May 24, 1898.

"Congo Sticks."—We are indebted to Messrs. Henry Howell and Co., of 180, Old Street, for a further contribution to the series of umbrella sticks and walking canes which have from time to time been presented by them to the Museums of the Royal Gardens. The specimens now received are the rough and finished sticks known in the trade as Congo sticks. The word "Congo" is a purely commercial name, the sticks being saplings of the Chestnut (*Castanea sativa*), which apparently offers advantages over other woods for manipulation while growing. The characteristic knots or markings for which the so-called Congo sticks are valued are produced by lacerating the bark through to the wood while growing. They were formerly obtained from the north of France, but are now almost exclusively produced in Austria-Hungary, the precise district being near Carlstadt, in Croatia.

Karité Tree.—Messrs. James Irvine and Co. wrote from Liverpool, 25th August, 1897:—

"Some months ago I wrote to you about a bean which Felix Dubois referred to in his book on 'Timbuctoo,' and you then stated your conviction that it was the Shea Butter (*Butyrospermum Parkii*, Kotschy).

The account of it in Dubois' book whetted my appetite, as its description met a want which I knew to exist in a particular branch of business, and I wrote to him to the care of his publisher, and yesterday I received a most interesting letter from him from the Niger. A copy of it, as far as it refers to the Karité bean, I send for your information ; I daresay the whole of it is already known to you, but it may not be, and, in any event, will be interesting."

[Enclosure.]

COPY of letter from M. Felix Dubois to Mr. James Irvine, dated Dienne, July 2nd, 1897.

My publisher forwarded your letter of May 10th, which reaches me here while on a fresh journey in the Niger country.

It is with the greatest pleasure that I send you some information respecting the Karité tree. I can do so better from here than elsewhere. At this moment the Karité nuts are ripe—they resemble small green apples. The green skin is very agreeable to eat ; unfortunately on each fruit there is only a very small quantity—the natives like it very much. Under this skin is a large nut, in size and appearance like the Indian Chestnut (*Æsculus indica*, Colebr.), with a thin light brown covering, and inside a white nut.

It is this white nut which gives the Karité butter. It smells, in fact just like chocolate. To our European scent it is even nasty. In fact, this fruit is not really known in Europe, but only the very slightly scented butter which is produced from it.

On the other hand, the travellers (Mungo Park and Lander) who were the first to notice it, probably were never present at the process of making the Karité butter, but contented themselves with the natives' account of the manufacture. Otherwise, certainly that smell of chocolate would have struck them. In order to be rid of that smell the nut must be taken out of the skin and dried. When the dried nut is put in boiling water the smell of the chocolate leaves it, and the liquid takes the colour of chocolate. Also, I am told that certain of our officers in the Soudan have the nut roasted and ground, and then use it as chocolate.

(Signed) FELIX DUBOIS.

Dr. Schweinfurth, in "*The Heart of Africa*" (Vol. 1, p. 220) refers in the following words to this useful tree, he says :— "The fruit is as large as a good sized apricot, and is enveloped in a green rind. This envelope can be kept till it is as enjoyable as a Medlar, and is considered one of the chief fruits of the country. From the kernels of this widely known tree an oil is expressed, which, under the name of 'butter of Galam,' is a recognised article of commerce in Gambia ; it has an unpleasant flavour which makes it not at all a desirable adjunct to the table, and so, for us, it has but an insignificant value. Its most valuable property is, that at a temperature of 68° Fahr. it becomes as solid as tallow.

"The tree itself is very handsome, having a bark which is regularly marked by polygonal rifts in its surface, and which permits it to be likened to an oak."

A full account of what was known at the time of the Shea Butter Tree, together with details gathered from Mungo Park's Travels will be found in the *Pharmaceutical Journal* (Vol. IX. [ser. 3], 1879, p. 818).

In Museum No. 1, case 69, are specimens fully illustrating the industrial applications of this tree, together with examples of the seeds as they appear in commerce. It may be well to mention that the Herbarium of the Royal Gardens contains a specimen of a variety collected at Borgu, by Mr. Barter, which is small-leaved, and flowers three weeks before the ordinary tree.

Stapelia gigantea, *N. E. Brown.* Recent discoveries point to the fact that in size and distribution this plant is the most remarkable of the whole tribe of Stapelieæ. Not only has it very much larger flowers, but its geographical range is vastly more extensive than any other known species, as the plants of this tribe are notably somewhat local or restricted in their distribution. *S. gigantea* was originally discovered by Mr. R. W. Plant, whilst collecting in Zululand, and at his death a living plant was brought, with the rest of his belongings, by his Caffir servants to Durban, Natal, where it is recorded as having flowered in 1860; and a portion of that plant was brought alive to England by Mr. T. Cooper, in 1862. It was next collected by Gerrard, in 1861, near the Umvelosi River, in Zululand. Since then it has also been found on the Magaliesbèrg Range, and near the Nylstroom River, in the Transvaal. In 1887 a specimen and a living plant were sent to Kew by Professor MacOwan, collected at Walfisch Bay, in Great Namaqualand, quite the other side of the Continent. And, lastly, specimens were sent to Kew, in 1897, from British Central Africa, by Mr. Kenneth J. Cameron, who states that it is "found growing wild at Namasi," in Nyasaland. This species has a range, therefore, through about thirteen degrees of latitude and seventeen degrees of longitude, being found within and without the tropic, and on both sides of the Continent of Africa.

N. E. Brown.

Serenoa serrulata as a remedy.—The following letter draws attention to the therapeutical value of the seeds of the "Saw Palmetto," which is abundant in the sandy soils of the Southern United States. A previous and more detailed account will be found in the *Planters' Gazette* (May 31st, 1879, p. 123). A tanning extract is obtained from the leaf-stalks; see *Pharmaceutical Journal*, July 6th, 1895, p. 4.

Professor C. S. Sargent to Royal Gardens, Kew.

Arnold Arboretum, Harvard University,
Jamaica Plain, Mass., February 4th, 1899.

My Dear Dyer,

We are sending you by express a small box containing various seeds and a supply of fruit of *Serenoa serrulata* for the Economic Museum. This fruit is now very largely used in this country in

the preparation of fluid extracts, about two hundred and fifty tons being consumed annually in this way. Its medical values are highly prized for the treatment of all diseases of the mucous membrane, and especially for the alleviation of troubles of the prostate gland.

Faithfully yours,
(Signed) C. S. SARGENT.

Sir William Thiselton-Dyer, K.C.M.G.,
Royal Gardens, Kew.

Chinese Medicinal Fungus.—The following communication relates to a fungus, apparently new to science, no account of which, or of its supposed virtues, appears to exist in the literature of Chinese medicinal plants.

It will be described as *Paxillus Osteopæon*, Mass.

MRS. E. L. KEMP TO ROYAL GARDENS, KEW.

Beechwood, Rochdale,
August 27th, 1897.

SIR,

I MUST apologise for troubling you, but my daughter has sent home the enclosed Mongolian mushrooms from China, and is anxious to know, if possible, what species they are. They are largely used there as medicine for diseases of the bone, and with good results. If you can give me any information about them I shall feel very much obliged.

Yours faithfully,
(Signed) EMILY L. KEMP.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 149-150.] MAY and JUNE. [1899.

DCXLVIII.—CAMPHOR.

(*Cinnamomum Camphora*, Nees.)

Enquiries continue to be made as to the cultivation of the tree producing this substance. A brief note was given in the *Kew Bulletin* for 1895 (p. 305).

Hitherto the use of camphor in medicine and the arts has been comparatively small. A new application is, however, likely to increase its consumption, perhaps indefinitely. This is described in the following words by Sir Frederick Abel, in a letter printed in the *Bulletin* :—

"This substance has been used extensively for many years past, and no doubt in continually increasing quantities, for the conversion of collodion cotton into the material known as *Celluloid*, which is applied to the manufacture of imitation ivory, tortoise-shell, horn, and a great variety of purposes."

An excellent account of the natural history and economic applications of the camphor tree was issued in 1897 by the Division of Botany of the United States Department of Agriculture, *Circular* No. 12. It is reproduced with some slight condensation :—

"DESCRIPTION.

"The camphor tree is an evergreen, related to the bay and to the sassafras of the United States. In its native habitat it attains a height of 60 to 100 feet, with wide-spreading branches and a trunk 20 to 40 inches in diameter. The leaves are broadly lanceolate in form, acuminate at both base and apex, of a light green colour, smooth and shining above and whitish or glaucous on the under surface The lower pair of lateral veins are more prominent than the others, but the leaves are not as distinctly 3-nerved as

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those of the cinnamon and many other species of the genus. The small white or greenish-white flowers are borne in axillary racemes from February to April on shoots of the previous season, and are followed in October by berry-like, one-seeded fruits about three-eighths of an inch in diameter. The fruiting pedicels terminate in a saucer-shaped disk, persisting after the mature fruit has fallen.

"Native Range.

"The camphor tree is native in the coast countries of Eastern Asia from Cochin China nearly to the mouth of the Yang-tse-kiang, and on the adjacent islands from the southern part of the Japanese Empire, including Formosa and the Loochoo Islands, to Hainan, off the coast of Cochin China. Its range also extends into the interior of China as far as the province of Hupeh, about 500 miles from the coast on the Yang-tse-kiang, in latitude 30° north. This area, extending from 10° to 34° north latitude and from 105° to 130° east longitude, is all embraced in the eastern monsoon region, which is remarkable for abundant rains in summer.

"The camphor trees growing wild in the native range are usually most abundant on hillsides and in mountain valleys where there is good atmospheric as well as soil drainage. The temperature in the greater part of this region, which is partly within the tropics and partly subtropical, rarely falls below freezing. The tree is an evergreen, changing its leaves generally in April, and therefore the winter temperature is a factor of more importance than would be the case with a deciduous tree.

"Range under Cultivation.

"Notwithstanding the comparatively narrow limits of its natural environment, the camphor tree grows well in cultivation under widely different conditions. It has become abundantly naturalized in Madagascar. It flourishes at Buenos Ayres. It thrives in Egypt, in the Canary Islands, in south-eastern France, and in the San Joaquin Valley in California, where the summers are hot and dry. Large trees, at least two hundred years old, are growing in the temple courts at Tokyo, where they are subject to a winter of seventy to eighty nights of frost, with an occasional minimum temperature as low as 12° to 16° F. The most northern localities in the United States, where the camphor tree has been grown successfully out of doors, are Charleston and Summerville, in South Carolina, Augusta, Ga., and Oakland, Cal.

"At Charleston, Sommerville, and Augusta the trees have withstood a minimum temperature of 15° F., but they have been protected by surrounding trees and buildings. At Mobile, Ala., the trees have grown and fruited in protected situations, while in exposed places they have been repeatedly destroyed by frosts. While the camphor tree will grow on almost any soil that is not too wet, it does best on a well-drained sandy or loamy soil, and it responds remarkably well to the application of fertilizers. Its growth is comparatively slow on sterile soils, but under favorable conditions it sometimes grows very rapidly. An instance is recorded of a camphor tree in Italy a foot in diameter and 90 feet high, eight years from the seed. Under ordinary conditions,

however, such a girth is not often attained in less than twenty-five years, and such a height is rarely attained in a century. Under favorable conditions an average of 30 feet in height, with trunks 6 to 8 inches in diameter at the base, may be expected in trees ten years from the seed.

"Uses of the Tree and its Products.

"The principal commercial uses of the camphor tree are for the production of camphor and camphor oil. Camphor is employed extensively in medicine. It enters into the composition of many kinds of liniments for external application. For liniment it is used especially in combination with olive oil. It is taken internally for hysteria, nervousness, nervous headaches, diarrhœa, and diseases affecting the alimentary canal. It is a specific in cases of typhoid fever and cholera. Camphor fumes have been used with success in cases of asthma. It has been used very extensively to keep insects out of furs, woolens, etc. In Japan, camphor and camphor oil are used in lacquer work. The oil is somewhat similar to turpentine, and could doubtless be used to advantage in varnishes and shellacs. It is now used in the manufacture of toilet soaps. In Japan and China it has been used for illuminating purposes, but it produces a smoky flame.

"Among the secondary uses of the camphor tree the most important is for ornamental planting. Its bright evergreen leaves, rapid growth, and long life make it valuable for this purpose. In Japan and China it has been the principal tree planted in the temple courts for many centuries, and in those countries it takes the place of the historic oaks of England. It has been extensively introduced into Southern Europe and South America for ornamental purposes.

"The wood, with its close grain, yellow colour, and susceptibility to polish, taking a kind of satin-like finish, is exceedingly valuable in cabinetwork, especially for making drawers, chests, and cupboards proof against insects. The leaves and young branches, although they have but a slight odour of camphor, are packed with clothing or scattered about unused rooms to guard against insects.

"The tree produces an abundance of berry-like fruits, which are used in Japan and China to make a kind of tallow. The fruits are greedily eaten by chickens and birds.

"Conditions of Successful Cultivation.

"For most of the secondary purposes, the camphor tree may well be cultivated wherever it can be made to live; but for commercial distillation, and for the production of wood for cabinet purposes, it must be grown under the most favorable conditions. The minimum winter temperature should not be below 20° F., and this minimum should be of rare occurrence. The soil, preferably sandy and well drained, should be irrigated unless there are abundant rains. Fifty inches of water during the warm growing season is desirable, and much more may well be used where the air is very dry.

"An abundance of plant food, rich in nitrogen, is required for rapid growth, but the kind of fertilizer that can be most profitably applied will vary according to the character of the soil in each locality. In the absence of definite information in this regard the kind of fertilizer producing most rapid growth of wood in the orange or in other fruit trees may be taken as an index.

"PROPAGATION.

"Camphor trees may be grown either from seed or from cuttings. They are usually grown from seed, as the trees fruit abundantly, and seedlings can be grown more easily than cuttings. The seeds are collected at maturity in October and November, and after drying are packed in sharp white sand or some similar material to keep them fresh until the time of planting in spring. About the last of March they are sown in drills in the seed bed.

"The soil of the seed bed should be a good sandy loam mixed with about one-third leaf mould. The seed bed should be kept moist, but not too wet, and should be shaded from the direct rays of the sun if the weather is warm. The best soil temperature for germinating camphor seeds is from 70° to 75° F. The temperature of the atmosphere may be ten degrees higher. The seedlings will grow well at higher temperatures, but are likely to lack vigour and hardiness.

"The seedlings may be grown in pots, which will facilitate transplanting at any time, or they may be transplanted in nursery rows early in April when one year old. Plants two years old are generally regarded as best for final planting. At this age they vary from 20 to 40 inches in height.

"PLANTING AND CULTIVATION.

"In Japan, where the law requires that a new tree shall be set out for every one cut, they are not generally set in straight orchard rows, but cultivation there is performed almost exclusively by hand labour. There are no records showing results of regular orchard planting, hence the distances at which trees should be planted must be determined by the size and form of the trees and the methods of cultivation and of procuring the gum. They may be set closely in rows about 10 feet apart, and alternate rows cut and reset every five years, thus producing bush-like plants of ten years' growth. They may be planted in checks 10 feet square, and alternate trees cut every ten or twelve years, or they may be planted in larger checks, and all of the trees be cut at the age of fifteen or twenty years.

"There are not sufficient data obtainable upon which to base definite statements as to the best methods of planting, or the age at which the trees may be cut with greatest profit. A recent English consular report from Japan states that 'although hitherto the youngest wood from which camphor was extracted was about seventy to eighty years old, it is expected that under the present scientific management the trees will give equally good results after twenty-five or thirty years.' Camphor of good quality has been produced in Florida from the leaves and twigs of trees less than twenty years old, 1 pound of crude camphor being obtained from 77 pounds of leaves and twigs.

"The trees will endure severe pruning with little apparent injury. One-third of the leaves and young shoots may be removed at one time without materially checking the growth of the tree. The largest proportion of camphor is contained in the older, larger roots; the trunk, limbs, twigs, and leaves containing successively a decreasing proportion. When the camphor tree is killed nearly to the ground by frost it sends up vigorous shoots from the base. It may be expected to do the same when cut, especially if cut late in the fall. Experiments are needed to determine whether this growth may be depended upon, or whether it will be more profitable to dig out the larger roots and set out new seedlings.

"DISTILLATION.

"In the native forests in Formosa, Fukien, and Japan, camphor is distilled almost exclusively from the wood of the trunks, roots, and larger branches. The work is performed by hand labour, and the methods employed seem rather crude. Different methods of distillation are employed in different districts, but those in use in the province of Tosa, in Japan, appear to be the most skilful. The camphor trees are felled, and the trunk, larger limbs, and sometimes the roots, are cut into chips by hand labour with a sharp concave adze.

"The fresh chips are placed in a wooden tub about 40 inches high and 20 inches in diameter at the base, tapering toward the top like an old-fashioned churn. The perforated bottom of the tub fits tightly over an iron pan of water on a furnace of masonry. The tub has a tight-fitting cover, which may be removed to put in the chips. It is surrounded by a layer of earth about 6 inches thick to aid in retaining a uniform temperature. A bamboo tube extends from near the top of the tub into the condenser. This consists of two wooden tubs of different sizes, the larger one right side up, kept about two-thirds full of water from a continuous stream which runs out of a hole in one side. The smaller one is inverted with its edges below the water, forming an air-tight chamber. This air chamber is kept cool by the water falling on the top and running down over the sides. The upper part of the air chamber is sometimes filled with clean rice straw, on which the camphor crystallizes, while the oil drips down and collects on the surface of the water. In some cases the camphor and oil are allowed to collect together on the surface of the water and are afterward separated by filtration through rice straw or by pressure.

"About twelve hours are required for distilling a tubful by this method. Then the chips are removed and dried for use in the furnace, and a new charge is put in. At the same time the camphor and oil are removed from the condenser. By this method 20 to 40 pounds of chips are required for 1 pound of crude camphor.

"The principles generally held to be essential in distilling camphor of good quality are :—(1) The heat must be uniform and not too great, producing a steady supply of steam; (2) the steam after liberating the camphor must not come in contact with metal, that is, the tub and condensing apparatus must be of wood.

"SUGGESTED IMPROVEMENTS.

"Many improvements upon the methods described can doubtless be made, tending both to a reduction in cost and an increase in the proportion of crude material obtained. Instead of an adze wielded by hand labor a machine similar to the 'hog' used for grinding up waste slabs in sawmills may be used to reduce camphor limbs to the requisite fineness for distillation. Better distilling apparatus can probably be devised. Thermometers may be introduced to determine the heat in the distilling tub, and the furnace may be so arranged as to permit better control and greater economy in fuel. Camphor and camphor oil are both slightly soluble in water, and the condensing chamber should be improved so as to recover the product that is being constantly carried off in the running stream which cools the chamber.

"OUTLOOK FOR FUTURE MARKET.

"The consumption of camphor in the United States, as measured by the importations, has been decreasing during the past ten years, while the price has been increasing.

"The tariff act approved July 27, 1897, imposes a duty of 6 cents per pound on refined camphor and leaves crude camphor on the free list, as heretofore.

"There has been an increase in importations of refined camphor, due to improved methods of refining and packing in Japan and to changes in the tariff, but this increase has been much more than counter-balanced by the decrease in importations of crude camphor. The decrease may be attributed to the following causes: (1) the exhaustion of the supply of the available camphor trees near the shipping ports; (2) the governmental restrictions on the trade in camphor in Formosa; (3) government taxes on the exportation of camphor from Formosa; (4) hostilities and wanton destruction of camphor stills by the natives in Formosa; (5) disturbances in the camphor-producing district of China; (6) the China-Japan war; (7) attempts by speculators to corner the market.

"These causes have increased the price of camphor, and this in turn has led to the introduction of substitutes. Menthol and other peppermint derivatives or compounds, carbolic acid and its derivatives, naphthalin, formalin, and insect-powder are now used for various purposes where camphor was formerly employed. Camphor has been manufactured artificially, at a cost leaving a margin of profit at present prices. It is therefore apparent that if the production of camphor from the trees is to be carried on with profit in this country, and the industry increased to any considerable extent, the price of camphor must be reduced to compete with the prices of substitutes now taking its place.

"Camphor has been obtained from several other plants not at all related to the ordinary camphor tree, but only two kinds, Borneo camphor and Blumea camphor, are of any importance commercially.

"Borneo camphor is obtained from the camphor tree of Borneo and Sumatra, *Dryobalanops aromatica*. It is deposited in clefts and hollows in the wood, and has simply to be taken out. This

camphor is comparatively rare, and the supply is consumed almost exclusively in China, where it is valued at from thirty to ninety times as much as ordinary camphor.

"Blumea camphor is obtained by distillation from *Blumea balsamifera*, a shrub growing in Burma and the Malay Peninsula. This is usually refined in Canton, whence about 10,000 pounds are exported annually. The source of this supply is abundant, and as the industry develops it is likely to enter more into competition with ordinary camphor. Neither of these plants can be grown in the United States, except possibly in southern Florida, without protection against cold.

"LYSTER H. DEWEY,
"Assistant in Division of Botany.

"Washington, D. C.,
"August 12, 1897."

There is a brief note on Borneo camphor wood in the *Kew Bulletin* for 1887 (September, p. 15), and a full account of Blumea camphor in the volume for 1895 (pp. 275–277, with plate, and also 1896, p. 73).

Production in China.

Dr. Henry, the well-known Chinese Botanist, gives the following account in the *Pharmaceutical Journal* (March 6, 1897, p. 201) :—

The camphor tree, *Cinnamomum Camphora*, Nees, is indigenous to Japan, Formosa, and the central and southern provinces of China. It has been known to the Chinese from ancient times, but apparently until 300 or 400 years ago only as a valuable timber tree.

The camphor first in use was undoubtedly the Borneo camphor, and, as Hanbury says ("Pharmacographia," p. 512), "at what period and at whose instigation the Chinese began to manufacture camphor from the camphor laurel is not known." Hanbury further states that "the camphor of European commerce is produced in Formosa and in Japan, and we have no evidence that any is now manufactured in China, although very large trees, often from 8 to 9 feet in diameter, are common, for instance, in Kiangsi, and camphor wood is an important timber in the Hankow market" (pp. 512, 513). The latest references to camphor production ("Index Floræ Sinensis," ii., p. 371) further would confirm this, viz. : "Kwangtung, common around Pakhoi, but not utilised (Playfair)." Again, "Dr. Henry states that the wood is much used in Central China, but no camphor is extracted." Until a few years ago, then, no camphor was produced on the mainland of China, but it is interesting to note that the camphor industry has been started in China, and that there are signs that it will become important. This is all the more noteworthy as Formosa has become Japanese territory, and it seemed likely that camphor would become an entirely Japanese article, not a desirable contingency in view of the fact that the Japanese Government is striving to establish a monopoly in the

production of camphor in Formosa, and has, no doubt, in contemplation the creation of a large revenue by enhanced prices in the future.

For a history of the vicissitudes of the camphor trade in Formosa itself the reader is referred to the Chinese I.M. Customs' "*Decennial Reports* for 1882–91" (pp. 439, 466). *En passant*, this is a most valuable work for all questions connected with Chinese commerce, the history of the treaty ports, etc. It is replete with information of all kinds, and is illustrated with maps, plans, and diagrams.

The growth of the camphor industry on the mainland of China is shown by the following facts, taken from various China Customs' Yellow-books. From the *List of Chinese Medicines* (Misc. Series, No. 17), which gives details of the trade in drugs of all kinds for the year 1885, it appears that camphor was unknown as a product of the mainland, except in the single province of Chekiang, there being the small export that year from Ningpo of 25 piculs. Ningpo exported 32 piculs in 1889, 40 piculs in 1890, and none since apparently. The Customs' *Trade Reports* for the different years show the gradual appearance of camphor production in other parts. Kowloon exported 88 piculs in 1888, 106 piculs in 1892, 87 piculs in 1883. This was conveyed in junks, and its *provenance* is doubtful, but it was perhaps from the province of Kwangsi. Canton exported 122 piculs in 1893, 37 piculs in 1894, and 237 piculs in 1895. This is Kwangsi camphor. The Pakhoi *Trade Report* for 1894 states that the first record of the article was in 1892; in 1893 the export was 23 piculs, which increased to 128 piculs in 1894, and "it comes from Lu-chuan, near Yu-linchou, and is likely to grow in importance, as plantations in that and other places in the neighbourhood are coming to the bearing age." In the Pakhoi *Trade Report* for 1895, the export is given as 596 piculs, and the writer says that this gratifying increase is due to the extended cultivation in Kwangsi. In Formosa only old and enormous camphor trees are utilised, and I am inclined to doubt of the existence of camphor plantations in Kwangsi; the camphor produced is more likely to be from old forest trees. The Chinese, at any rate, did not plant any trees with a view to the manufacture of camphor.

In 1895 the exports of camphor from different Chinese ports were:—Foochow, 187 piculs; Amoy, 668 piculs; Canton, 237 piculs: Kowloon, 68 piculs, and Pakhoi, 596 piculs. In the Fukien province there are large forests, and camphor trees abound. Some years ago a party of Japanese went into the interior of Fukien to manufacture camphor, but nothing came of this attempt. The Foochow export is probably the product of this province, but that of Amoy is doubtful, as it may be Formosan camphor smuggled over to the mainland in junks. The export of the other three ports is produced in the Kwangsi province, and this will probably grow into large figures if camphor continues high enough in price to encourage the Chinese in its manufacture.

To sum up, the production of camphor on the mainland of China is an affair of the last few years. It began in Chekiang, but has practically ceased in that province. In Kwangsi it commenced a short time ago, and promises to develop into importance. The Fukien product is only trifling so far.

Production in Formosa.

The following is extracted from the Foreign Office *Report on Trade in Japan* for 1897. (Misc. Series, 440, pp. 71–72.)

The trade in camphor will probably undergo some modification. Camphor trees are not found in that part of the island (of Formosa) occupied by Chinese settlers. They occur only in the country of the aborigines, or upon the immediate border, and up to the present time the destruction of trees has been carried on in the most wasteful manner. The mode of obtaining supplies of camphor was for foreign merchants through Chinese agents to advance money to the savage chiefs for permission to cut down trees. The stills were erected at the expense of the foreigners, who paid a tax of 8 dol. a still to the Chinese authorities, and a local tax of 10 dol. on each picul (133 lbs.) of camphor produced. When the island was ceded to the Japanese the privileges which foreigners had enjoyed under Chinese rule, of having these camphor establishments in the interior, seemed likely to be withdrawn by the Japanese Government. The Chinese treaty, much more than the Japanese, gives freedom of travel and trade to the foreigner; and if the limitations imposed by our treaty with Japan had been strictly enforced in Formosa, foreigners would have had to retire to the treaty ports. They would have been debarred from distilling or purchasing camphor in the interior, and they would have suffered heavy losses in abandoning the capital already sunk there. Considering that the present treaty had only two more years to run, the Japanese Government has consented to let matters remain *in statu quo*; and when under the new treaty, foreigners obtain a right to settle anywhere in the interior, they will be able to distil as much as they like. But there is also a probability that the preparation of camphor will be made a Government monopoly. With the Formosan supply under its control the Japanese Government could almost secure a monopoly of the camphor trade, for Japan and Formosa are almost the only sources of supply; and advantage may be taken of this to put Formosa's finances on a satisfactory basis. The lands where the camphor trees grow are not privately owned as is the best portion of Formosa's fertile plains, so the Government could appropriate the camphor producing districts without interfering with vested interests.

The following further information is given in the Report on the Trade of Tainan for 1897 (*Foreign Office Annual*, 2149, pp. 5–6) :—

The camphor trade has, so far as concerns foreign merchants in South Formosa, almost entirely stopped, owing, among other causes, to the disturbed state of the country and the difficulty and danger of sending money into the camphor districts. The roads continued throughout the year to be infested with armed robbers, who, on the approach of the military or police, fled to the hills (where it was, apparently, impossible to pursue them), only to reappear at the first favourable opportunity. Robberies became of such frequent occurrence that no foreign or native merchant would venture to send money into the interior. The Japanese authorities, on their part, did not see their way to allow the tax to be paid in the treaty port on arrival of the camphor, and business was consequently brought to a standstill.

In the raids and skirmishes, too, which have taken place in the camphor-producing districts, numbers of stills have been destroyed. Their destruction was, perhaps, inevitable, but as they were almost entirely erected with money advanced or loaned by foreign merchants in South Formosa, the losses incurred by the latter have been very considerable. It is estimated that not one-third of the stills in existence two years ago, in which foreigners in South Formosa are interested, are now available for camphor production.

The hope expressed by Her Majesty's Consul in last year's report, that the camphor trade might revive and assume large proportions, has not been realised; in fact, far from this being the case, the camphor export business, as far as South Formosa is concerned, has now (April, 1898) almost stopped.

These remarks, of course, apply exclusively to the export of camphor by foreign merchants in this district (South Formosa) who have in the past invested considerable sums of money in the business. The production of camphor in the districts of Rinkipo and Shu Shu (Hunlin and Chip Chip), the principal districts whence the drug came to South Formosa, still, I am informed, continues, though to nothing like the same extent as formerly; but all the camphor so produced finds its way viâ the port of Rokko (Lokkang) to Tamsui, whence it is shipped to Hong Kong and Japan. The roads north of Rokko are said to be perfectly safe, so that dealers can reach the neighbourhood of Chip Chip and buy up any camphor that, under other circumstances, should and would go to the foreign firms in Tainan, with whose money the business was first started. Things may remedy themselves in course of time, but the outlook at present is certainly not very bright.

The following table shows the export of camphor from this port since, practically, the commencement of the trade:—

Years.	Number of Boxes Exported.
1892	4,315
1893	6,691
1894	12,157
1895	10,145
1896	8,001
1897	3,057

NOTE.—One box contains about one picul (133½ lbs.) of camphor.

PRODUCTION IN CEYLON.

The cultivation of the camphor tree has attracted some attention in Ceylon. But, as will be seen from the following correspondence which has appeared in the *Ceylon Observer*, both it and the production of the drug are in the experimental stage.

Superintendent, Hakgala Botanic Gardens, to Editor "Ceylon Observer."

Botanic Gardens, Hakgala,
April 6th, 1898.

Dear Sir,

Referring to your question as to what is being done with camphor cultivation in Ceylon, I may add the following to what I wrote you on the 11th of February last. Wishing to satisfy myself that solid camphor exists in the leaves and twigs of even very young plants, I sent a small bundle of prunings, from plants planted out at the end of 1895, to Mr. S. A. Owen, of Messrs. W. Jordan & Co., of Lindula, who had very kindly undertaken to make the experiment for me. I am pleased to state that he has been very successful in extracting solid camphor from them ; and as this is of general interest to planters, I shall be much obliged if you will be good enough to publish Mr. Owen's letter in an early issue of your paper.

The prunings from an average plant 28 months' old, as grown here, weigh from 10 to 12 lb.

I have a good many plants that want pruning, and if applied to before the end of this month, April, I shall be very glad to supply 10 or 20, or 35 lb. prunings to any person wishing to make the experiment for himself.

I am, &c.,
W. Nock.

Mr. S. A. Owen to Superintendent, Hakgala Botanic Gardens.

Talawakele, March 30, 1898.

Dear Mr. Nock,

Thanks for the parcel of camphor prunings duly received. I have made several experiments. The following is the account of method employed and results :—

*   *   *   *   *

A gallon iron kettle was packed with $1\frac{1}{2}$ lb. of leaves and small twigs, together with about two pints of water. The cover of the kettle was luted on and the spout fitted with a cork, while a long glass tube proceeded from the cork to a condenser. Applied heat gradually, and kept it up for five hours. At the end of this time the sides of the condenser were coated with camphor, and small lumps were floating in the water which distilled over. All the camphor was collected carefully and dried between bibulous paper (to absorb most of the adhering oil). It then weighed 55 grains, which is equivalent to 12 ounces to the cwt. or 15 lb. to the ton.

I think the results very encouraging, as the leaves and young parts of the camphor tree contain but a very small proportion of camphor compared with the trunk-wood. Indeed, I believe that in Formosa and other camphor-producing countries, it is customary to altogether discard the branches and leaves and use the main-wood only.

I should think that planters who have young camphor trees coming on here in Ceylon would find it well worth their while to utilise their prunings—especially if firewood is available and cheap, as this latter item would be practically the only expense, beyond the small amount of labour required and the initial expense of a still, which latter could be easily extemporised out of almost any kind of large iron vessel to which heat could be applied. As the camphor tree is a long while coming to maturity, considerations of this kind ought to be borne in mind.

I have pleasure in enclosing a small sample of the camphor obtained. As you will see, it has a rather dirty appearance, due to unavoidable impurity and the sample smells of camphor oil, but these are easily got rid of in the process of refinement. I also enclose a small sample of the same camphor partly purified by sublimation.

You are, of course, very welcome to make what use you like of this account of these small experiments, whether by publication or otherwise. No doubt it would be encouraging to those who have gone to the expense of planting up camphor trees to know that there is camphor in our locally grown trees. I have heard of one or two misgivings as to whether the soil and climate here would favour the formation of camphor in the tree.

Yours faithfully,
(Signed) S. A. Owen.

DCXLIX.—PERUVIAN RUBBER.

Up to the present time little or nothing has been known botanically with respect to Peruvian rubber. Our knowledge, in point of fact, was pretty well limited to the following statement reprinted in the *Kew Bulletin* for 1892, p. 69, from a valuable article in *The India-rubber and Gutta Percha and Electrical Trades Journal*:—

"There comes from Peru, at the sources of the Amazon and its tributaries, a rubber resembling the Nicaragua Sheet, and called Caucho. This rubber is very wet, and consequently shrinks very much, which is a serious drawback. It is considered a good strong rubber, and it is utilised to a considerable extent by the boot and shoe manufacturers."

The following correspondence supplies the first information as to the actual source of Peruvian rubber.

FOREIGN OFFICE to ROYAL GARDENS, KEW.

THE Under Secretary of State for Foreign Affairs presents his compliments to the Director of the Royal Gardens, Kew, and is directed by the Secretary of State for Foreign Affairs to transmit to him the accompanying paper noted in the margin, respecting a tree which grows in Peru and produces the quality of India-rubber known as "Caucho."

Foreign Office,
May 17, 1899.

Mr. Consul Churchill to Foreign Office.

Her Majesty's Consulate, Pará,
April 28, 1899.

My Lord,

It may interest those concerned to know that the tree which produces the quality of India-rubber exported from Peru, through Pará, under the name of Caucho, has recently been determined by Monsieur Huber, a botanist, who is on the scientific staff of the Museum of Pará.

Monsieur Huber lately visited the Ucayali region in Peru, and discovered that the tree was a *Castilloa.*

He will shortly be able to decide, by comparison, whether it is the same as the *Castilloa elastica* of Central America, or a species of the same genus. It had been surmised previously that the tree might be a *Castilloa*, but I believe Monsieur Huber is the first authority who has settled the point. With this knowledge it results that the distribution of the *Castilloa* is wider than was previously thought to be the case.

"Caucho" is also produced in the neighbourhood of the Bolivian tributaries of the River Amazon, and from parts near the said tributaries that pass through Brazilian territory.

A sample of "Caucho" exists, in the Museum of this City, that came from the banks of the River Tocantins.

It is said that "Caucho" is also produced near Macapa and Mazagao, on the north bank of the River Amazon, near its estuary.

A recent statistical return on the exports of the State of Pará reports that this produce was exported in small quantities (altogether about 10 tons) from Aveiros (River Tapajos), Santarem, Alemquer and Obidos on the River Amazon. The total shipments of "Caucho" from Amazonian ports amount to about 2,000 tons annually.

Monsieur Huber describes the process of tapping as follows :—
"The trunk is almost severed in two at a distance of about 3 feet from the ground, and the tree is allowed to fall in such a manner that it is supported in an inclined position by its branches, and still holds on to the part that is left standing. The sap is collected and poured into a hole made in the ground, and is coagulated by means of the juice of certain local lianas. The natives state that this is the best method of tapping, and that if the trees were treated in the same manner as the Heveas they would soon be destroyed by insects which would attack them where the bark would be injured by incision. This may be only an excuse for unnecessary destruction which might be avoided. However, it must be considered that as these trees grow far apart from each other in their native state it must be inconvenient, if not impossible, to attend to more than one tree at a time.

Trees that have been tapped in the manner described do not survive the operation. In the course of time their places are, no doubt, taken by young trees that grow from seeds.

The Amazonian Castilloas are found on elevated land that is beyond the reach of floods, whereas the Heveas thrive best in the lowlands that are periodically inundated by the River Amazon.

I have, &c.,
(Signed) Wm. A. Churchill.

The Marquess of Salisbury, K.G.,
&c., &c., &c.

ROYAL BOTANIC GARDENS, KEW, to FOREIGN OFFICE

Royal Gardens, Kew,
May 23, 1899.

SIR,

I HAVE the honour to acknowledge the receipt of your letter of May 17, transmitting a copy of Consul Churchill's report on a kind of India-rubber exported from Peru, through Pará, under the name of Caucho.

2. Caucho, of which Caoutchouc is probably an expanded form, has been hitherto identified with "India-rubber" *par excellence*, the produce of one or more species of *Hevea* indigenous to the basin of the Amazons, and exported from Pará. According to the information now received, the Caucho tree of Peru is a *Castilloa*. One or more species of this genus produces the india-rubber of Central America. In South America *Castilloa* has been known to extend as far as Ecuador, where it is called Jebe, otherwise Jeve or Heve. According to Aublet this latter name was given in Northern Ecuador to a species of *Hevea*, and in founding that genus he derived its name accordingly. In the Amazon basin the name for the species of *Hevea* is "Seringa," and in Central America for those of *Castilloa* "Ule" or "Tunu" (see *Kew Bulletin*, 1898, pp. 141, 142). Perhaps in Western South America the names Caucho and Jebe are applied indiscriminately to rubber-producing trees.

3. According to a report by Mr. D. B. Adamson, H.B.M. Consul at Iquitos, dated December 24, 1898, and published in the *Transactions of the Liverpool Geographical Society* for the same year, Peru has two kinds of rubber-producing trees: Caucho, which appears to belong to *Castilloa*, and Jebe to *Hevea* (pp. 39–40). Both Mr. Adamson and Mr. Churchill agree that the rubber is extracted from the Caucho tree by felling. The Jebe is always tapped. The former process results in a district being "worked out." In consequence, according to Mr. Adamson, "many of the 'Caucheros' [or rubber collectors] are working on Brazilian rivers, where the supply is yet more plentiful."

4. It is not, however, necessary to fell the *Castilloa* trees to collect the rubber. The method of tapping is minutely described in a report by the United States Consul-General Beaupré, published in the United States *Consular Reports* for May, 1899, pp. 147–151. The estimated yield per tree is much smaller than that given in Sir Henry Derling's report, as to which I addressed some enquiries to the Foreign Office in my letter of April 14, 1897.

I am, Sir,
Your obedient Servant,
W. T. THISELTON-DYER.

The Under Secretary of State
for Foreign Affairs,
Foreign Office, Downing Street, S.W.

EXTRACT from Report by Consul D. B. Adamson in *Transactions Liverpool Geographical Society*, 1898, pp. 39–40.

"As you are aware, rubber is the chief article of export, and hitherto has been practically the only one of any importance. Its extraction from the trees and preparation for the market is

principally in the hands of Peruvians, assisted by Indian labour. The work is rough, and the hardships connected with gathering are very great. The kind exported from here in past years has been chiefly Caucho, the gatherers of which are known as Caucheros. The wasteful method adopted is, however, beginning to tell adversely as far as this particular class of rubber is concerned. This can be understood when it is explained that Caucho is gathered by cutting down the trees to collect the sap. As it is said that it takes from 15 to 20 years to arrive at a fit state to be worth cutting down, it can easily be seen that those in accessible positions are continually growing scarcer. As none are planted to supply the loss, when a district has been worked thoroughly, nothing can be done till nature re-asserts herself. Of course the young trees are constantly growing, and places that have been worked out will, in course of time, yield again in quantity, but meanwhile the yield in them is so small that it is not worth while to collect. It must be remembered that it is only possible to collect near the rivers, on account of the difficulties of transport overland. In the interior, or rather inland from navigable waters, probably there are plenty of Caucho yielding trees still, for there are vast tracts of land absolutely unexplored. These, however, are either inaccessible or would be unremunerative to work.

"It is much to be desired that some more economical method of gathering Caucho could be introduced, one which would allow the sap to be got without destroying the trees, as the timber is worthless. This is done in other parts of the world where more economical conditions prevail. At present many of the Caucheros are working on Brazilian rivers, where the supply is as yet more plentiful. The heavier export duties of Brazil will cause the Caucheros to return to Peru, when, in the absence of Caucho, they will devote themselves either to its cultivation, which is scarcely likely to any large extent, or gathering the other chief kind of rubber, known as Jebe.

"This is of considerably higher value than Caucho, being worth from 70 per cent. to 90 per cent. more, according to ruling prices here. The method of gathering it, however, has not been so well understood by the native labourers, or they have not found the work so much to their taste.

"In gathering Jebe the tree is simply tapped, the sap being collected in small pans, which are emptied daily or periodically. This class of rubber collecting is conducted mainly by settlers, as distinguished from the wandering Caucheros."

To complete the available information on the subject, the following extract from Mr. Consul Adamson's Report on the Trade of Iquitos is reprinted from the Foreign Office *Report on the Trade and Finances of Peru* (1898, p. 13, No. 2,298) :—

"Rubber forms the chief article of export. Most of it goes to Europe, and very little attention is given to other productions of the district. The chief classes are Caucho and Jebe, the present prices of which may be taken as 30 and 50 soles per arroba of 15 kilos. respectively. It may be stated that these figures show a marked increase during the year. The average for 1898 is given as 26 soles per arroba for Caucho and 49 soles per arroba

for Jebe. A slightly lower grade of this may be named as about 2 soles lower in price. There is also Sernamoi or scrap rubber, both of Jebe and Caucho, the average price of which during the year is given as 37 soles per arroba. The total value of all classes during the year is given as £202,916, as compared with £206,047 the year before, the quantities being 1,140,523 kilos. in 1897, and 829,935 kilos. in 1898. This falling-off may be accounted for by the increasing inaccessibility of the Caucho bearing trees, those within easy reach having become scarce owing to the wasteful method of gathering the gum. The process has been to cut down the tree instead of merely tapping it.

"The trees are all wild, and it will take some years to allow them to grow sufficiently to gather from again. Another reason for the falling-off last year, and one of perhaps equal weight with the former, is that a large number of the Caucheros, or rubber gatherers, have gone to the Jurua and other Brazilian rivers, whence, however, there are grounds for saying the bulk of them will return. As a rule the Caucheros are not familiar with the collection of Jebe, or fine rubber, but they are learning, and when they return to Peru will probably devote more attention to it.

"The proportion of this to Caucho has considerably increased lately. Jebe is gathered by tapping the trees, a certain number of which are placed under the control of a gatherer, who visits them daily to collect the yields."

DCL.—EUCALYPTUS TIMBER FROM WEST AUSTRALIA.

The use of Jarrah timber (*Eucalyptus marginata*) and Karri (*Eucalyptus diversicolor*) for wood-pavement has been noticed on several occasions in the *Kew Bulletin* (1890, p. 188 ; 1893, p. 338 ; 1897, p. 219).

The following correspondence, which refers to the various purposes to which these and other West Australian woods can be applied, is published for general information :—

COLONIAL OFFICE TO ROYAL GARDENS, KEW.

Downing Street,
September 14, 1898.

SIR,

I AM directed by the Secretary of State for the Colonies to transmit for your information a copy of a despatch from the Governor of Western Australia, enclosing a Report upon the Sixth Annual Conference of Producers of the Colony.

I am, etc.,
(Signed) H. BERTRAM COX.

The Director,
Royal Gardens, Kew.

GOVERNOR OF WESTERN AUSTRALIA TO COLONIAL OFFICE.

Government House, Perth,
June 30, 1898.

SIR,

* * * * *

3. During the months of last year from August to November I thought it desirable to visit the principal agricultural districts of the Colony that I might be able to give you, as I promised before leaving England, an impartial account of the condition and prospects of the Colony in this respect. You will, I am sure, recognise the value and importance of feeling assured that, apart from the gold industry, the Colony has a future before it of no uncertain character in the development of the natural resources of the soil.

* * * * *

5. I need only add a few words about the timber industry, which did not come within the scope of my address, but the prospects of which did not escape my attention during my travels.

Jarrah and Karri timber are the principal products of this character. The forests of both varieties in the South and South-West of the Colony are very extensive, and have not been fully explored. It is said they are inexhaustible, but, judging by what I have seen, I am by no means of this opinion. In those districts I have seen, in which timber is being felled and exported for home or foreign use, the waste is almost more than the mind of man can conceive. I can understand that it does not pay to lead bad timber to market, but greater care might be taken in examination before felling timber indiscriminately, and simply on the chance of its being good enough for market. It is said that where one tree is felled there a dozen spring up to take its place. This is true, but the time taken before the young trees mature sufficiently for market purposes robs any such statement of all its importance and sufficiency.

6. So far as the values are concerned of these two timbers, Jarrah and Karri, I understand both are being largely exported to the United Kingdom for wood pavements, and the former especially for railway sleepers, dock staging and wharfs. I think the Western Australian Jarrah has a great future before it. It fills all the essential conditions which are necessary to make it a first class railway sleeper, and as the ever-increasing weight and speed of trains in the United Kingdom will require a heavier and more rigid road in proportion to the increased weight of steel rails, it is likely to find a lively market in the near future. At the same time it is not superior to the South Australian Red Gum. The durability of both will be, even on the heaviest gradients and at the highest rates of speed with ordinary train loads, from 15 to 21 years against 7 to 10 years of the English sleepers commonly used hitherto. For piles and staging, and wharf and dock gates, Jarrah seems impervious under water to all attacks of wind and weather and marine life, and I should not hesitate to use it with as great readiness as Greenheart. I feel some doubt as to its suitability for wood pavement. The cleavage with the grain is so easy that I think the cost of maintenance and repairs will be heavy, and the

dust in dry weather, owing to the large amount of acetic acid in this timber, will be found to be peculiarly painful and irritating to the eyes.

7. Karri timber below water is practically useless, rotting very readily, and if used for wood pavement in a damp climate like England, is foredoomed to failure unless the water is constantly swept off it. Used above water for structural purposes, that is, free from contact with the ground, its life seems to be eternal, being practically impervious to ants and worms, and not so inflammable as Jarrah. For structural purposes in large buildings I should regard it as quite equal to the best old seasoned English oak.

8. There are other valuable woods, such as the Jam-wood (unrivalled for fencing) and Sandal-wood ; but the supply of both is limited, and of the latter almost exhausted by the demands of the Chinese market.

9. I am glad to be able to add, in conclusion, that we are having, so far, an abundance of rain, and the agricultural prospects were never better. In view of the recent largely increased settlement upon the land, this is a great blessing. A contrary condition would have caused at a critical moment almost irremediable disappointment to a large number of new settlers, who look to the next harvest to reap the first return they have had for their labour and capital.

I have, &c.,
(Signed) GERARD SMITH.

The Right Honourable
J. Chamberlain, M.P.
&c., &c., &c.

ROYAL GARDENS, KEW, TO COLONIAL OFFICE.

Royal Gardens, Kew,
September 20th, 1898.

SIR,

I HAVE the honour to acknowledge the receipt of your letter of September 14th (17240), transmitting a despatch from the Governor of Western Australia, dealing principally with Jarrah and Karri timber. I propose to publish for general information in the *Kew Bulletin* so much of the despatch as relates to this subject.

2. The facts in our possession do not, however, entirely confirm the statements of the Governor as to the difference in the qualities of the two woods. I enclose a memorandum on the subject from the Keeper of the Museums.

3. The Timber Museum of the Royal Gardens contains a magnificent log of Jarrah, weighing nearly five tons, which was shown at the Colonial and Indian Exhibition. It also contains a log of Karri exposed between high and low water-mark in Western Australia for forty-two years, and still in good condition.

4. I enclose copies of the numbers of the *Kew Bulletin*, in which the use of Jarrah and Karri for wood-paving is discussed. These would probably interest the Governor if transmitted to him.

I am, &c.,
(Signed) W. T. THISELTON-DYER.

H. Bertram Cox, Esq.,
Colonial Office, Downing Street, S.W.

[Enclosure.]

Jarra and Karri Timbers.

The woods of Jarrah (*Eucalyptus marginata*) and Karri (*E. diversicolor*) are both much used, and advertised by rival firms, for road-paving, but Jarrah appears to be most in demand.

"The cleavage with the grain" of Jarrah, spoken of in paragraph 6 of Governor Smith's letter, does not appear to be possible judging from the blocks contained in the Museum, which are typical of ordinary road blocks used in London. Nor do I remember having seen this objection raised ; indeed, there seems to be but little difference in the twisted grain of either of the woods Jarrah and Karri.

The South Australian Red Gum, referred to also in paragraph 6 of the above letter, is apparently *Eucalyptus rostrata*, the durability of which Maiden describes as "perhaps having a rival only in *E. marginata*."

J. R. J.

19th October, 1898.

DCLI.—MISCELLANEOUS NOTES.

Mr. Alec Arthur, a member of the gardening staff of the Royal Gardens, has been appointed by the Municipal Council of Shanghai, Superintendent of Parks, Recreation Grounds, etc., in that town. He leaves for China on May 18th.

Mr. John Gossweiler, recently a member of the gardening staff of the Royal Gardens, has been engaged by the Portuguese Government for the curatorship of a Botanic Station in Loanda, Angola. He leaves for Africa in May.

Linnean Medal.—The President and Council of the Linnean Society awarded the Linnean Medal (which is given bi-annually) to Mr. J. G. Baker, F.R.S., late Keeper of the Herbarium and Library of the Royal Botanic Gardens, "for his services to Botany during a long series of years, especially his writings on ferns and petaloid monocotyledons, serviceable alike to botanists and cultivators." The presentation took place at the Anniversary Meeting on May 24th.

Rescue from Drowning.—A gallant feat which has not been noticed in its place must not pass unrecorded. On February 24th, a visitor attempted suicide by plunging into the pond in front of the Palm-house. Fortunately two young gardeners were passing at the time on their return to work after the dinner hour.

The man had already sunk beneath the surface, when one of the young gardeners, W. C. Fishlock, jumped in, swam out and succeeded in bringing the man to land. C. G. Girdham, who had received instruction in a St. John's Ambulance class, was able to induce artificial respiration, and the man was eventually sent to his home.

The circumstances having been reported to the Royal Humane Society by Her Majesty's First Commissioner of Works and Public Buildings, the certificates of the Society were awarded to the young men, and presented to them by the Director on March 16th.

Botanical Magazine for April.—The variety of the familiar *Impatiens Roylei* which is the subject of plate 7647 appeared in the shrubberies of Sir J. D. Hooker's garden at Sunningdale, three or four years ago. Sir Joseph is unable to explain how it was introduced into his garden, and whence it came. It is assumed that this plant, which differs from the type in being more robust and in having larger inflorescences of pale rose-coloured flowers, is a native of the Himalayas. The specimen of *Cereus paxtonianus*, which species includes *C. Cavendishii*, was acquired by purchase. The Kew plant has a slender, erect stem about four feet high. Its flowers, which were produced for the first time at Kew in September, 1898, are white, and three to four inches in diameter. *Silene Fortunei*, from China and Formosa, resembles superficially the *Lychnis Flos-cuculi* of our meadows. The seed from which the specimen figured was raised was collected in Shensi by Father Piccoli, of the Jesuit Mission in Hankow, and were received at Kew through G. Murray, Esq., F.R.S., Keeper of the Botanical Department of the British Museum. A plant of *Yucca elata*, a native of the South-Western United States, was purchased in 1893, and flowered in 1896. This specimen has now a trunk about a yard long. The flowers are two inches long, and white. *Incarvillea variabilis*, from Western China, has elegant foliage and loose racemes of bright rose-purple flowers. Seeds of this plant were sent to Kew by Mr. W. Thompson, of Ipswich.

Botanical Magazine for May.—*Nicotiana sylvestris* is a robust species from Argentina, quite recently introduced into cultivation. The large leaves resemble those of *N. tomentosa*, and the flowers those of the well-known *N. alata*, (*N. affinis*). The Kew plants were raised from seed communicated by Messrs. Dammann & Co., of Naples. *Cyrtanthus parviflorus* is allied to *C. angustifolius*, having, however, smaller, more brightly coloured flowers. Bulbs of this plant, which is a native of the Cape, were presented to Kew by E. H. Woodall, Esq., of Scarborough. *Alnus nitida* occurs at elevations of 4,000 to 9,000 feet in the Western Himalaya. This, and *A. nepalensis*, a species as yet not introduced into English gardens, are the only representatives of the genus in the Indian flora. Seeds of the former were sent to Kew by the late R. Ellis, Esq., in 1882. *Dahlia maximiliana* is a little-known species.

though it was exhibited at a show of the Royal Horticultural Society in 1879. Its beautiful, mauve-coloured flowers are produced during the winter months. The specimen figured was furnished by Thomas Hanbury, Esq., F.L.S., from his magnificent garden at La Mortola. *Veronica Dieffenbachii*, from the Chatham Islands, is allied to *V. speciosa* and *V. macroura*. The drawing was made from a specimen communicated by R. Lindsay, Esq., of Kaimes Lodge, Murray Field, Midlothian.

Hooker's Icones Plantarum.—The last part of the sixth volume of the fourth series, containing plates 2,572 to 2,600, was issued in March, 1899. Plates 2,572 to 2,574, illustrating the genus *Hevea*, belong to the previous part, the original impression having been totally destroyed by fire. They illustrate the floral structure and the seeds, both dormant and germinating, of some of the principal species. One more new species of *Hevea* is figured in this number, supplemented by a plate of drawings selected from some unpublished figures in the British Museum. *Ficus laurifolia*, Lam. (plate 2,578), is a handsome species cultivated in Italy and Egypt, the origin of which is uncertain. Three more plates represent as many species of *Eryngium*, natives of Central America, where the genus exhibits a great and widely different variety of forms. Plate 2,584 represents the male flowers and inflorescence of the singular pandanaceous genus *Sararanga*, prepared from material collected in Solomon Islands by the Rev. R. B. Comins. *Limacia monilifera* is another interesting plant from the same source. This number also contains some of the high-level plants of recent discovery in Tibet and British New Guinea, and further illustrations of the marvellously rich flora of Western China. A kind of sarsaparilla cultivated in Jamaica is figured under the name of *Smilax utilis*.

Kew in the Colonial Office List.—At the request of the Editors, the following brief account of Kew has been furnished for this publication. It appears on page 19 of the issue for the current year :—

"ROYAL BOTANIC GARDENS, KEW.

"Kew as a scientific establishment dates from 1759, when a Botanic, or, as it was then called, a Physic, Garden was established by the Princess Augusta of Saxe-Gotha, Dowager Princess of Wales.

"It was energetically maintained by her son, George III., with the scientific assistance of Sir Joseph Banks, who was virtually for the greater part of his life Director. Under his advice collectors were sent to all parts of the world. The first New Holland plants were introduced during Cook's voyages, 1768–1780. At Sir Joseph Banks' instance the system of inter-colonial exchange was commenced, which has been maintained ever since. The most memorable undertaking of this kind was the voyage of

the 'Bounty' (1787) for the purpose of introducing the bread-fruit tree from the South Seas into the West Indies. Nelson, the Kew collector, was amongst those sent adrift by the mutineers, and eventually died of the exposure. Another Kew gardener, James Hooper, who had been attached to Lord Amherst's Embassy to China, remained in Java, and was from 1817–30 Hortulanus of the celebrated Dutch Colonial Botanic Garden at Buitenzorg, which he helped to create.

"Both George III. and Sir Joseph Banks died in 1820, and the colonial and other work of Kew languished, though it was not absolutely abandoned, during the reign of George IV. and William IV. In 1838 the abolition of the whole establishment was contemplated by the Government. Public opposition led to the appointment of a Treasury Committee, the report of which was presented to Parliament in 1840. The following paragraphs briefly defined the functions of the reorganised establishment:— 'A national garden ought to be the centre round which all minor establishments of the same nature should be arranged . . . From a garden of this kind Government would be able to obtain authentic and official information on points connected with the founding of new colonies; it would afford the plants there required without its being necessary, as now, to apply to the officers of private establishments for advice and assistance.'

"These recommendations having been adopted by the Government, Sir W. J. Hooker, F.R.S., was appointed Director in 1841 to carry them out. A close connection between Kew and the Colonial Office immediately sprang up. A scheme for a complete series of Colonial floras was sanctioned in 1856, and has been steadily prosecuted. Kew serves to a large extent as an advanced horticultural school. Special attention is given to the preparation of gardeners for Colonial service. Some 60 men trained at Kew are now in official employment in different parts of the Empire.

"Relations with the botanical institutions of the self-governing Colonies are maintained by semi-official correspondence. With those of Colonies more directly under the control of the Colonial Office, the connection is closer.

"Colonial botanical institutions fall roughly into three classes. Those of the first class are usually, like Kew, administered by a scientific Director; those of the second class by a skilled Superintendent; the third class consists of Botanic Stations. These last are small and inexpensive gardens, devised in 1885, in order to afford practical instruction in the cultivation of tropical crops, and were intended to develope the agricultural resources, at first, of the smaller West Indian Islands, and subsequently (1887) of British Possessions in Tropical Africa. Each is in charge of a Curator, who is a gardener trained at Kew.

"The principal members of the Kew staff are:—

"Director: Sir W. T. Thiselton-Dyer, K.C.M.G., C.I.E., LL.D., F.R.S.

"Keeper of the Herbarium and Library: W. B. Hemsley, F.R.S.

"Honorary Keeper of the Jodrell Laboratory: D. H. Scott, Ph.D., M.A., F.R.S.

"Keeper of Museums: J. R. Jackson, A.L.S.

"The most important Colonial botanical institutions in intimate relation with Kew are :—

"Ceylon.—Director of Royal Botanic Gardens : J. C. Willis, M.A.

"Straits Settlements.—Director of Gardens and Forest Department : H. N. Ridley, M.A.

"Jamaica.—Director of Public Gardens and Plantations : William Fawcett, B.Sc.

"In 1898, in accordance with the recommendations of the West India Commission, a Special Department of Agriculture was created for Barbados, the Leeward and the Windward Islands, and was placed under the charge of a Commissioner, with headquarters at Barbados.

"Commissioner of Agriculture at Barbados : D. Morris, C.M.G., D.Sc., M.A."

Completion of the Temperate House.—On Bank Holiday, May 1, the North Wing, the last uncompleted portion of the Great Temperate House, was thrown open to the public. The completion of the South Wing was announced in the *Kew Bulletin* for 1897 (pp. 333, 334). The *Building News* for February 12 and 19, 1897, contained a full account of it, with detailed drawings.

Some particulars may now be given of the structure as a whole, and of the history of its erection. The first scheme of the house was projected by Sir William Hooker, in 1855. The design, as now practically completed, was made by Decimus Burton, who also designed the Palm House. The *Builder* for January 12, 1861, contains a ground plan and elevation, with detailed particulars of the whole structure.

In 1860 Her Majesty's Office of Works entered into a contract with Messrs. Cubitt "to construct the centre of the new Temperate House in Kew Gardens and the octagons for the sum of £28,858." The actual cost appears to have been approximately about £29,000. The roof is of wrought-iron, the columns of cast-iron. At present prices it is estimated the building would cost one-third more. On the other hand, a lighter construction would have been employed, and the cost might not have exceeded £30,000.

In 1861 the octagons at either end were finished. Taking *outside* measurements for these (as for all other portions of the structure) their diameter is 54 feet.

In 1862 the central part of the building was completed : it is 216 feet long by 140 feet wide, and (inside) 60 feet high. A raised terrace was made for the building, and space provided on it for the two wings. Their erection was, however, indefinitely postponed in 1863, although the foundations had been partially laid ; part of the iron-work lay in the contractor's yard for many years, and was eventually broken up.

In 1894, thirty-one years later, the erection of the South Wing was sanctioned, and in 1897 that of the North. The former was completed in that year and the latter in the present. A period of thirty-nine years has, therefore, elapsed between the commencement of the structure and its completion.

While the general features of Decimus Burton's design have been followed, the construction of the North Wing is much lighter than that of the South. The material used is rolled steel. The house was erected with rapidity and thorough precision in the workmanship by Messrs. Mackenzie and Moncur, of Edinburgh, and glazed under their direction by Messrs. Rendle. The drawings were prepared and the whole work supervised by E. G. Rivers, Esq., the Surveyor of Her Majesty's Office of Works in charge of Kew.

Each wing is 116 feet long by 64 feet wide and (inside) 38 feet high. Four lobbies, each 12 feet long by 7 feet wide, two at either end, connect the octagons to the wings and the central part to the octagons. Beyond the wings are entrance porches, each 12 feet by 8 feet.

The total extreme length of the building is thus 628 feet, and, including the porches at either side, the greatest width is 164 feet.

The cost of each wing has been about £7,000. The total cost of the whole building has been, therefore, £43,000. This includes the provision of spacious under-ground tanks for the collection of rain-water.

In the original scheme of the house, Sir William Hooker had in view the completion of the representation of the woody vegetation of the world. That of the Tropics was provided for in the Palm House, and that of the Cool Temperate Zone in the Arboretum. The object of the Temperate House was to provide accommodation for the plants of intermediate climates which would not tolerate an English winter. Sir William Hooker explains, in his Report for 1859, that "as the contents of this structure will be of the same character as those hardy plants which constitute the 'Arboretum,' it is the intention to erect it within the so-called Arboretum or Pleasure Ground," as that was then termed.

In his *Report* for 1866, Sir Joseph Hooker, in again urging "the completion of this grand structure, by far the finest in Europe," suggested "devoting one of the contemplated wings to the plants of our northern colonies and possessions, and the other to those of the southern."

In the centre block Australian and New Zealand vegetation is predominant. As explained in the *Kew Bulletin* for 1897 (p. 334), the contents of the South Wing have largely a Mexican character. In other words, it is devoted to plants of warm temperate countries, which in cultivation require a "warm greenhouse" treatment.

The North Wing, on the other hand, has been devoted to Himalayan, Chinese, and Japanese plants, which, while for the most part able to resist an English winter, are unable to tolerate the rigour of an English spring.

The plan of laying out the ground in the interior is the same as that of the South Wing. This has been described in the *Kew Bulletin* (l.c., p. 334). The beds contain a complete collection of Himalayan rhododendrons, together with some of their most striking tender hybrids, camellias, etc. The centre walk is lined with clumps of the Japanese *Phyllostachys mitis*, obtained from Algeria. At the north end there is a rock pool on either side.

The North Wing, when given up by the contractors, was furnished with great rapidity, largely due to the generosity of D. H. Shilson, Esq., of Tremough, Cornwall. This county is the natural home of these magnificent plants in England, and now repaid its debt to Kew, from which it originally received them when introduced by Sir Joseph Hooker. The late Mr. Shilson, father of the present owner of Tremough, was one of the first to take up their cultivation. "Several of the plants" transported from Cornwall to Kew are said to have "required a separate railway truck each, and were nearly two tons in weight." A prominent feature is a large camellia 15 feet high, removed from Kensington Palace Gardens, where it had been grown by Mrs. Falk, who presented it with other plants to the Royal Gardens.

The fine and lofty specimen of *Trachycarpus excelsus* (Chamærops excelsa) was the gift of the Right Honourable Joseph Chamberlain, M.P., F.R.S., from whose conservatory at Highbury, Birmingham, it was removed. It is a happy memorial of the exertions of this distinguished statesman in securing the assent of two successive Governments to the completion of this great undertaking.

It only remains to say that the contents of the two octagons have been re-arranged. They are not well suited for the cultivation of a miscellaneous collection. The southern is now devoted to an orangery which has long been a desideratum at Kew ; the northern to standard Bays, &c. Space in each is afforded for the display of trained plants of *Clematis*, &c., in the summer, and of chrysanthemums in the autumn.

An excellent detailed account of the completed structure, with illustrations, is contained in the *Gardeners' Magazine* for May 27, 1899, pp. 310–312.

It may be added that the area of the whole structure is $1\frac{2}{3}$ acres, more than three times that of the great conservatory at Chatsworth.

Queen's Cottage Grounds.—In accordance with the announcement made in the *Kew Bulletin* for 1898 (pp. 200, 201), the Queen's Cottage Grounds were thrown open to the public on May 1. The entrance is near the Isleworth Ferry Gate, and a railed path has been carried through terminating near the path through the Pinetum leading to the Lion Gate. This allows the Cottage, the expanse of wild hyacinths, and the sylvan features of the grounds to be fully seen by visitors without unnecessarily disturbing perhaps the only "sanctuary of all bird life" which remains in the immediate proximity of London.

Bulbs from Asia Minor.—Kew owes its unique display of early flowering spring bulbs in great measure to the constant liberality of Mr. Edward Whittall, of Smyrna. A brief note of his contributions appears in the *Kew Bulletin* for 1893 (p. 147). We owe to him the sheets of white *Galanthus Elwesii* and of blue *Chionodoxa* which each year produce more and more striking effects.

The following letter gives some idea of the scale on which Mr. Whittall works as well as of the important industry which he has incidentally created :—

MR. EDWARD WHITTALL TO ROYAL GARDENS, KEW.

Smyrna, April 28, 1899.

DEAR SIR,

OUR winter has been, comparatively speaking, just as mild as yours in England. You would have been surprised to see my garden at Christmas with the rose trees, geraniums, and even cannas in full bloom, the arums in the ponds full of buds and the camellias backed up by the white Roman hyacinths simply covered with flowers. It was a pretty sight, and one I never witnessed before. Now of course it is wearing its spring garb, and you could cut roses by the thousand. The water lilies are showing their first flowers and the beds are gay with bright colours. I will send you later on a few photographs to give you an idea of an Oriental garden with an admixture of English and Italian ideas in the plan.

I note your requirements of small bulbs, and will be only too happy to ship you all I can on the old conditions. I suppose this will mean some 300,000 or 400,000 of all varieties. By the bye, what did you think of the new snowdrop I sent you ? I flowered it in my garden and certainly it appears to carry out my first description.

I am glad to see the bulb trade developing so much with England. When I commenced it, I only hoped to give a few weeks' work to some deserving poor in our village. Now I employ hundreds of families, and the blessings you British flower-lovers receive should lighten your slumbers as the saying goes in this land of beautiful ideas and expressions. I am now opening out a new trade in cultivated bulbous plants, such as hyacinths, &c., and hope shortly to ship not a few. As you well know, most of these plants came originally from this country and do well. I am proud to see around me the increase in the consumption of flowers, and to feel that it is the result of my efforts to develop the love of them. Some few years back you scarcely saw a plant outside a few European gardens ; now even the smallest cottage plot is bright in Spring with flowers. This is the pleasure I get out of my hobby, and, now that my collecting expenses are covered by European shipments, I cannot even complain of the cost being too heavy.

I was not carried off by brigands, but a nephew of mine. Thank God all is well that ends well.

Believe me, &c.,
(Signed) EDWARD WHITTALL.

Sir W. T. Thiselton-Dyer,
Kew, London.

Jyree Tea.—By the kindness of Mr. G. S. Peterson, of Weston-super-Mare, we have received a sample of this so-called tea, and find that it is made of leaflets apparently belonging to some species of *Acacia*. Mixed with the leaflets are petals which may

well be those of a *Cassia*, and a little ordinary tea had been added to one sample, but Mr. Peterson says that such is not always the case. Jyree tea is the name under which this mixture has been offered for sale in Britain. It is of Indian origin, probably from Madras, and cannot as yet be said to have any extensive use. "Jyree," we are informed, is a name derived from that of the native servant of an Anglo-Indian who claims to have discovered its virtues. "Jyree" oil is said to be a cure for aches and sprains: "Jyree" soap is said to soften the skin, and "Jyree" may be used, too, for softening leather.

Moseleya.—In a recent number of *Hooker's Icones Plantarum* a very rare plant, which was originally described as *Hornemannia pinnata*, Benth., and subsequently reduced by the same botanist to the genus *Sibthorpia*, is figured (t. 2,592) under the name of *Moseleya pinnata*, Hemsl. Excellent specimens received from China seemed to warrant restoring this interesting plant to generic rank, and as the name *Hornemannia* was already in use, the genus was dedicated to the memory of the late Professor H. N. Moseley. Shortly after this publication, Mr. N. E. Brown recognised in it the *Ellisiophyllum reptans*, Maxim., founded on Japanese specimens in 1871, and described by the author as "inter Polemoniaceas et Hydrophyllaceas." So few specimens existed in herbaria that nobody appears to have identified Maximowicz's Japanese plant with that described by Bentham from India, though the late Dr. Baillon (*Bull. Soc. Linn. Par.*, 1890, p. 817) referred it to the Scrophulariaceæ, and the vicinity of *Littorella*. As there is no doubt of the identity, *Ellisiophyllum* is the name to retain, and it is to be hoped that the name of Moseley may yet be connected with a plant previously undescribed.

Catalogue of the Kew Library.—This has been printed for the convenience of the staff and of botanists working in the establishment. The preface, by the Director, re-produced below, gives an historical account of the origin, formation, and development of the library. The catalogue is printed on one side of the paper throughout. It will be useful, therefore, as a basis for the library catalogues of similar establishments. A limited number of impressions have been struck off, and these may be obtained, price 7*s.* 6*d.* (exclusive of postage), on application to the Curator, Royal Botanic Gardens, Kew.

"A library of books of reference is a necessary adjunct to a Botanic Garden in order to illustrate its contents and verify their nomenclature. For a large herbarium it must be even more extensive, as constant reference has to be made to the descriptions given by multitudinous writers of the plants of every country of which such a herbarium contains specimens. Still more copious must it be for an establishment like Kew, which is constantly called upon to afford information to the public and the Government on every subject connected with the vegetable kingdom.

"The foundation of Kew as a scientific establishment dates from 1759, in which year the Princess Augusta of Saxe-Gotha, Dowager Princess of Wales (who resided at Kew till her death in 1772), established a Botanic, or, as it was then called, a Physic Garden. In the development of the collections the Dowager Princess of Wales had the assistance of John Stuart, third Earl of Bute, who had been Lord of the Bedchamber to the Prince. He was the possessor of a fine collection of botanical books and used a house adjoining the Royal Gardens, now known as Church House, as a library.

"The Earl of Bute fell out of favour with George III., and retired to his house near Christchurch, in Hampshire, where he died from the effects of a fall while collecting a plant, in 1792.

"His place as scientific adviser at Kew, and, in point of fact, as honorary director, was taken by Sir Joseph Banks, the president of the Royal Society and a personal friend of the King. He was the possessor of one of the finest libraries of botanical books which has ever been formed. The celebrated Robert Brown was his librarian, and part of his duties was to afford scientific assistance to the Superintendent of the Royal Botanic Gardens at Kew. Banks bequeathed his library a few months before his death to the trustees of the British Museum, where it is still preserved. But he left Brown the use of it during his lifetime, and an annuity, on condition that he continued his scientific aid to Kew.

"Besides this, the official residence of the Superintendent, now used as the business offices of the establishment, contained a room which was used as a library. In 1841 the maintenance of Kew was transferred from the Crown to the public charge. The books in his care disappeared, being regarded probably either as the private property of the superintendent, or as that of the Crown.

"During the reign of George IV. Sir Everard Home, who appears to have succeeded to the honorary position occupied by Banks (*Kew Bulletin*, 1891, p. 319), suggested the establishment of a library at Kew. The charge was to be entrusted to the well-known botanical artist, Francis Bauer. According to a statement in Loudon's *Gardener's Magazine* (vol. xvii., 1841, p. 187) 'The house now belonging to the King of Hanover was purchased for this purpose; the shelves were prepared, all the botanical books in the King's library were to be removed there, and some had, in fact, been sent down, when, unfortunately, a dispute arose respecting the land, to which the Woods and Forests laid claim.'

"This statement is not absolutely exact. The house never belonged to the King of Hanover, though it was for a time occupied by him. It was known as Hunter House, having been the property of a successful man of business, Robert Hunter, who had settled at Kew. It was purchased in 1818 by George III. at the instance of Sir Joseph Banks, and for the purpose—to which it has long since been devoted—of a library. Sir Everard Home simply endeavoured, therefore, to carry into effect Banks's scheme. In 1823 George IV. sold the house and grounds to the nation, its use as a library having, apparently, as stated above, been abandoned. In 1830 William IV. granted it to the Duchess of

Cumberland for her life. It was only on the Duke's accession to the throne of Hanover that it became known as the 'King of Hanover's House.' He resided in it occasionally, but after his death it remained unoccupied.

"When, therefore, in 1841, Sir William Hooker was appointed Director of the reorganized Botanic Garden, he found himself destitute of even an official commencement of the two essential requisites of a scientific botanic establishment—a herbarium and library. Fortunately he was personally well provided in both respects, and he generously offered to make available for public use those which he himself possessed. The Government, on its part, agreed to rent a neighbouring house, afterwards known as West Park, for their accommodation, and as a residence for the Director, 'there being no suitable house belonging to the Crown vacant at the time.' In 1852, though still remaining his private property, the Director's herbarium and part of his library were removed to the present building. Its occupation for the purposes of the library and herbarium dates from that year.

"In the same year the commencement of an official library at Kew was made by the gift, by Miss Bromfield, of the botanical books of her deceased brother, Dr. W. A. Bromfield; its especial feature was the number of fine copies, chosen with fastidious taste, of the earlier botanical authors. This was followed in 1854 by the gift by the late George Bentham, Esq., C.M.G., F.R.S., from 1861 to 1874 President of the Linnean Society, of his fine botanical library, which was very complete in what may be called 'working books.'

"In 1867 (after his death) the Treasury sanctioned the purchase of such of Sir W. Hooker's books as were wanting in the library, and which, though the establishment had had the use of them, were not its property. These included many scarce and costly books which rarely come into the market, and had been procured with much trouble and expense on the continent; there was also a valuable collection of travels. At the date of his decease Sir W. Hooker was the possessor of the finest private botanical library in existence, the result of nearly sixty years' assiduous collecting. Through this purchase the Kew library was more than doubled in extent.

"These three important acquisitions formed the backbone of the present library. Gaps have been gradually filled up by subsequent gifts and bequests. A number of volumes mostly relating to Cryptogamic Botany were received in 1887 from the late Rev. M. J. Berkeley, F.R.S. The most important bequest was that in 1889 of the botanical library of the late John Ball, Esq., F.R.S., Parliamentary Under Secretary of State for the Colonies, 1855–7, and first president of the Alpine Club. This was rich in works relating to the European flora, and in fine copies of books mainly collected in Italy.

"In 1892 Thomas Hanbury, Esq., of La Mortola, Ventimiglia, Italy, presented an important selection of books from the library of his late brother, Daniel Hanbury, F.R.S., the well-known pharmacologist.

"In 1877 the interior of Hunter House was remodelled in order to give more convenient accommodation for the library.

"The purchase of new books has been provided for since 1849 by a small annual subsidy from the Government. And this has been further supplemented more recently by the grant of free binding by H.M. Stationery Office. A large number of serials and periodicals in which the library is especially rich are acquired by exchange with the *Kew Bulletin*. The Bentham Trustees from time to time use the funds at their disposal, in accordance with the testamentary dispositions of the late George Bentham in the purchase of books beyond the means of the annual Government grant. The library being also available for the scientific researches of botanists of all nations, is constantly in receipt of valuable contributions from foreign governments, universities, societies, and independent workers. The liberality of the United States and French Governments deserve especial mention.

"On the whole it is probable that no official library of such conspicuous utility has ever been got together at so small a cost to the public. Its primary object is necessarily the routine work of the establishment. Subject to the requirements of this it is freely available for the use of independent scientific workers, a privilege which is largely taken advantage of. But it is not available for merely literary purposes or work.

"The manuscript catalogue having become unmanageable, the Treasury sanctioned in 1896 the employment of B. Daydon Jackson, Esq., Secretary to the Linnean Society, to prepare, with the assistance of the scientific staff, a new one, which should be based on a fresh collation of the books. It was further decided that this should be printed and published. It is hoped that apart from its immediate purpose it will be found of service as a bibliography, and for use in other scientific and technical libraries.

"The present catalogue has been brought down to 1898. Annual lists of future additions will be published in the *Kew Bulletin*.

W. T. THISELTON-DYER,
Director.

Royal Botanic Gardens, Kew.
March, 1899.

Curaçao Aloes.—This drug was formerly supposed to be derived from the same plant as Barbados aloes (*Flückiger and Hanbury, Pharmacographia*, 2nd ed., p. 679). The latter is yielded by *Aloe vera*, L. (A vulgaris, *Lam.*) Of the plant yielding the former, Mr. E. M. Holmes obtained authentic specimens through Professor Van Eeden, of Haarlem (*Pharm. Journ.*, September 13, 1890, p. 205). They were unhesitatingly referred by Mr. J. G. Baker to *Aloe chinensis*, Baker (*Bot. Mag.*, 6,301), of which the native country is unknown.

Mr. Holmes remarks :—

"It would appear that the Curaçao aloe plant is nearly allied but yet specifically distinct from *A. vera*, L. (A. barbadensis, *Mill.*), so that the specific difference might go far towards explaining the characteristic odour and appearance of Curaçao aloes as compared with the Barbados aloes of commerce."

Mr. Consul Jesurun, in his *Report on the Trade of Curaçao and its Dependencies for* 1898, p. 7, gives the following account of the present state of the industry :—

"A trifling quantity of aloes came from the Island of Aruba, and has been re-shipped to New York, the only market where anything near the cost price of manufacturing could be obtained for the indifferent quality. Aruba, Bonaire, and Curaçao could produce very clean and high grade aloes were the price for such quality any better than that obtainable at present on foreign markets, where buyers give preference to the dirty or low grades on account of cheapness, and because those who handle this article abroad are able to obtain, by means of suitable machinery and processes, the exact grade desired at a far lower cost than is possible in these islands. The low prices for this article have been yielding less, owing to the higher duties levied by this Government, and the producers and exporters have suffered greatly. In the Island of Bonaire, where there are large tracts of land planted only with aloes, the producers are unable to export any quantity for the above reasons, and the same is to be said as to this island."

Assam Rubber in Egypt.—A short note in the *Kew Bulletin*, 1897, p. 429, announced the commencement of an attempt to produce rubber from *Ficus elastica* in Egypt. The following two supplementary letters show the promise that Mr. Floyer has met with in continuing the experiment :—

MR. E. A. FLOYER TO ROYAL GARDENS, KEW.

Cairo, July 17, 1898.

SIR,

THANK you for sending me the *Bulletin* about our india-rubber.

This year we are trying the yield of each tree. Mr. Luiji Heinschneider, of the Gezira Palace, has placed some trees 28–30 years old at our disposal. So far two are tapped. No. 1 gave $2\frac{1}{2}$ lbs.; No. 2, $5\frac{1}{2}$ lbs. The tapping is conducted with a view of getting another yield next year from the same trees.

The year's crop of cuttings will be about 7,000 only. We are still unsuccessful with seed.

Yours truly,
(Signed) ERNEST A. FLOYER.

Cairo, June 12, 1899.

DEAR SIR WILLIAM,

THE three trees, *Ficus elastica*, which I tapped last year, and which yielded $10\frac{1}{2}$ lbs. of rubber, sold at 3*s*. 3*d*. per lb., have been tapped again this spring. They yielded $5\frac{3}{4}$ lbs. of rubber, the principal falling off being in tree No. 2, which is much overgrown by tree No. 1.

I have put out this spring nearly 3,000 *Ficus*, and hope in due time a rubber industry may be started.

Yours truly,
(Signed) ERNEST A. FLOYER.

Pæony disease.—Pæonies have shared in the revived popularity of herbaceous gardening. Frequent complaints are, however, made of their liability to disease. Characteristic specimens have been received this year from the Royal Botanic Gardens, Glasnevin. The following report was furnished upon them, which is published for general information :—

The Pæonies are suffering from "drooping disease," caused by a minute fungus called *Sclerotinia Pæoniæ.*

Spraying at intervals of four days with a solution of potassium sulphide (1 oz. of potassium sulphide dissolved in 3 gallons of water) will check the spread of the disease.

To prevent a recurrence next season, diseased leaves should be removed promptly, to prevent the formation of sclerotia in the diseased tissue. During autumn, the soil should be removed from the crown and round the root, and replaced by fresh soil mixed with quicklime.

Spray next season, at intervals of a week, with potassium sulphide solution, commencing first when the leaves appear above ground.

G. M.

May 5th, 1899.

Cultivation of Turnsole.—The Parisian daily paper *Le petit Journal* of December 11, 1898, contained the following account of the cultivation of *Chrozophora tinctoria* at Grand Gallargues in the department of Gard, South France :—

"This year's harvest, which has been a fairly good one, is for the most part as usual absorbed by the Dutch cheese industry. Our soil is peculiarly suited to the cultivation of *Chrozophora tinctoria* (Croton tinctorius ; *Croton des teinturiers* or Turnsole), and it grows with us even in a wild state.

"When the reaping is done, our farmers gather the stems and leaves together and place them in small heaps on the outskirts of the village to ferment. Fermentation brings about the changes necessary for the development of the fine red dye, which for centuries has been employed by the Dutch cheese-makers. Year by year for several centuries has a Dutch ship put into Cette and taken off a cargo of Croton stems and leaves prepared as just described.

"To give them their red colour, the cheese manufacturers of Holland wrap their cheeses in the Croton leaves and take them out the red balls, which are exported the whole world over. Grand Gallargues is thus the source of the red of the Dutch cheese."

A little of interest may be added to the above. Not until 1808, was it shown clearly that turnsole could be cultivated from seed. Before this date, the people of Grand Gallargues, which, then, as now, was the centre of the industry, harvested their entire crop from wild plants. Year by year in the months of July, August, and September, they scattered through the departments of the South of France—Bouches du Rhône, Var, Gard, Hérault, Pyrénées orientales and Vaucluse—gathering the plants where abundant, and fermenting them on the spot.

TEA & COFFEE DISEASES.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 151-152.] JULY and AUGUST. [1899.

DCLII.—TEA AND COFFEE DISEASES.

(With Plate.)

Brown Blight of Tea.

The "blights" which affect tea in Assam were investigated and described in the *Kew Bulletin* for last year (pp. 105–112). Another and different one has made its appearance in Ceylon, and has been transmitted to Kew for investigation by Mr. J. C. Willis, M.A., F.L.S., Director of the Royal Botanic Gardens.

Director, Royal Botanic Gardens, Peradeniya, Ceylon, to Royal Gardens, Kew.

Royal Botanic Gardens,
Peradeniya, Ceylon,
April 10, 1899.

Sir,

By parcel post this week I send you a tin containing some specimens of a fungus blight which is causing considerable injury to tea in many of the planting districts of Ceylon. It resembles the "grey blight" of Assam (which is also common here) in its action on the leaf, and I have recommended similar measures for its eradication to those used for that pest. The specimens enclosed show the conidial fructification of the fungus, and I am sending them in the hope that you may be able to give me the name of the fungus to enable me to round off my investigations into its ravages and life history. In the event of your publishing any account of this disease, I have to request that the name of the estate mentioned on the specimens be withheld from publication.

Notes upon the disease are given below.

I am, &c.,
(Signed) John C. Willis.

The Director,
Royal Gardens, Kew.

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[Enclosure.]

Specimens from Maskeliya district, 4,000 feet above sea level, sent to Kew. Fructifying specimens pinned. Collected 7th April, 1899.

Disease like grey blight in appearance and effect, but characterised by chocolate-brown colour of fully diseased spots on the leaves attacked. Common in the Central Province.

Shows first on upper side of leaf, and soon afterwards on lower also. Appears as yellowish-brown patches, which rapidly spread and darken to a chocolate or almost black colour, and as they extend their central parts dry up, die, and often fall out if the leaf is roughly shaken. When the leaf is held up to the light, a yellowish band, 1–3 mm. wide, is seen round the infected area, due to the spreading of the mycelium into the still unattacked area of the leaf, which loses its green colour.

Fructifications not often seen; on the accompanying specimens they show in typical form, as pinkish spots, more or less concentrically grouped. The spores are oval-oblong, unicellular, hyaline. The blight spreads very rapidly, and does much damage. Measures of treatment recommended are the same as for grey blight.

J. C. W.

10th April, 1899.

The specimens were examined by Mr. Massee, the Principal Assistant for Cryptograms in the Herbarium of the Royal Gardens. He furnished the following report:—

The fungus proves to be undescribed, and may be known as *Colletotrichum Camelliæ*.

All the many known species of *Colletotrichum* are parasites, and many are destructive to important economic plants.

Spraying with Bordeaux mixture, or with ammoniacal solution of carbonate of copper has proved effective in checking the spread of other species of *Colletotrichum*, and would probably prove beneficial in the present instance. In spraying plants like the tea, having glabrous leaves, success mainly depends on the fineness of the spray, which should hang like a fog. A coarse spray causes the solution to form drops which roll off the polished surface of the leaves.

In addition to spraying, all diseased leaves should be collected and burned, as *Colletotrichum* is a form-genus (=the conidial condition of an ascigerous fungus), and if the leaves are allowed to fall and remain on the ground under the trees, the higher form of fruit would form on the decaying leaves and inoculate the new leaves the following season.

G. M.

3rd May, 1899.

The following description has now been prepared by Mr. Massee:—

The fungus present on the leaves proves to be a species of *Colletotrichum*, a genus perhaps too closely allied to *Glœosporium*, differing only in the presence of a variable number of coloured

spines being intermixed with the conidiophores. Numerous species belonging to these genera are known as destructive parasites, attacking more especially leaves and fruit.

The leaves of the tea plant are probably infected in the first instance by floating spores settling on their upper surface when damp. The discoloured portion of the leaf corresponds to the range of mycelium in the tissues. Eventually the central portion of the blotch changes to a dull grey colour, and becomes studded with numerous very minute black spots, which are often arranged in irregular circles. These points correspond to the clusters of spores which rupture the epidermis of the leaf and become free on the surface, whence they are washed by rain or carried by wind to other leaves. After the spores are mature, those portions of the leaf on which they are produced become dry and brittle, and are blown about by wind, and as many spores still adhere to such floating fragments, it is not difficult to understand why the disease spreads so quickly when once established in a plantation.

As the species proves to be undescribed, the following diagnosis is given :—

Colletotrichum Camelliæ, *Massee* (sp. nov.) *Maculæ* amphigenæ effuso-indeterminatæ, primo flavo-brunneæ, dein nigrescentes, denique griseo-arescentes, postremo frustulatim deciduæ ac folium perforatum relinquentes. *Acervuli* centro maculæ laxe insidentes, epiphylli. *Conidia* cylindraceo-elongata, continua, utrinque obtusata, hyalina, episporio levi donata, 15–17 × 4–5 μ. *Cystidia* lineari-cuspidata, septata, olivacea, 100–135 × 7–8 μ.

CEYLON. Central Province. On living leaves of *Camellia Thea.*

Preventive measures. Bordeaux mixture has been proved to arrest the spread of disease caused by other species of *Colletotrichum*, as *C. lindemuthianum* on scarlet-runners and French beans, *C. Altheæ*, on hollyhocks, &c., and would probably prove effective in the present instance. Care should be taken to experiment at first with a very dilute solution until its action on the leaves is ascertained.

Diseased leaves should be picked before the spores are mature ; that is, as soon as the first indications of the presence of the fungus are observed. If this practice was universally followed through the infected area, the disease could be readily exterminated.

CENTRAL AMERICAN COFFEE-DISEASE.

This disease has attracted attention for rather more than the last twenty years. But it is, perhaps, only of late that it has attained serious dimensions. Apparently, the first notice is contained in the *Kew Report* for 1876 (p. 21), where it is noticed as "Mancha de hierro" or "Iron stain." Berkeley attributed it to a minute fungus, *Depazea maculosa*, which was the only organism he could find on the diseased leaves. Dr. Ernst, however, in his *Estudios sobre las deformaciones, Enfermededas y enemigos del arbol de Cafe en Venezuela*, Caracas, 1878, was unable to accept this as the cause of the malady :—

"Berkeley opina que la *Depazea* es causa de la 'Mancha de hierro,' sin duda porque las hojas que le fueron remitidas,

vinieron con esta denominacion. No queremos contradecir el aserto de tan respetable autoridad, pero tendremos más adelante ocasion de comprobar que la enfermedad llamada así ēs generalmente de otro orígen" (p. 17).

He further expressed the opinion that "iron stain" was to be attributed to more than one cause, and that while in some cases it might be due to a fungus, it was generally the work of the "Coffee-leaf Miner," *Cemiostoma coffeellum.* An account of this will be found in the *Kew Bulletin* for 1894 (pp. 130–133).

"Compréndense acaso bajo este nombre tambien otras manchas de aspecto semejante, pero debidas á la vegetacion de un hongo, como se ha dicho más arriba; pero generalmente es la 'Mancha de hierro' el resultado de la presencia de la larva de una pequeña mariposa nocturna, que en la zoología lleva el nombre de *Cemiostoma coffeellum*, Stainton" (p. 17).

This opinion is important as showing that at the date (1878) when it was written the injury done by the fungus was inconsiderable.

What appears to be the same disease was the subject of a note in *Nature* by Dr. Ernst (July 29, 1880, p. 292). He says:— "There appear on the leaves small spots of a lightish green colour, which in two or three days turn brownish." Hence the name of "Iron stain."

Dr. Cooke detected upon these patches a fungus of an entirely different kind, which he described in *Grevillea* (vol. xi., p. 11) as *Stilbum flavidum.* He further discussed the whole subject in the *Journal of the Linnean Society* (*Botany*, vol. xviii., pp. 461–467).

Spegazzini has recently suggested the name of *Pistillaria flavida* for the fungus on the assumption that it belongs to the Basidiomycetes. This view is not, however, supported by a microscopic examination of authentic specimens.

Of late years the ravages of the fungus have assumed more serious dimensions. It has proved very destructive in coffee plantations in Costa Rica, Venezuela, New Grenada, and Guatemala; it is also said to have occurred in some of the West Indian Islands.

The Government of British Central Africa, apparently under the impression that it is the leaf disease of Ceylon (*Hemileia vastatrix*), which it is not, has "temporarily proclaimed" Guatemala and the Central American States generally "to be prohibited countries" for the importation of seeds and plants.

A lengthy correspondence has taken place with the Foreign Office on the subject, of which the following is the most material portion:—

MR. CONSUL-GENERAL JENNER TO FOREIGN OFFICE.

MY LORD, Guatemala, February 7, 1899.

WITH reference to your Lordship's despatch, No. 14, commercial, of the 4th of November, I have the honour to enclose herewith copy of a despatch from Mr. Consul Harrison, enclosing a short report by Mr. H. Pittier on the diseases which have at different times appeared in the coffee plantations in Costa Rica.

The samples of the dried leaves are being sent to your Lordship by parcels post.

I have, &c.,
(Signed) G. JENNER.

The Marquess of Salisbury, K.G.,
&c., &c., &c.

[Enclosure.]

REPORT of Mr. Henri Pittier on the diseases which have at different times appeared in the coffee plantations of Costa Rica.

During the existence of the Instituto Fisico Geografico several coffee diseases were submitted for study to the botanical department.

Firstly, the so-called "Maya," characterised by circular zones of dead tissues on the leaves, black rotten spots on the fruit, and by the subsequent falling off of both. The fungus which causes the destruction of the tissues has been identified independently by two specialists: Messrs. Rolfs, of the Florida State Agricultural College, and Spegazzini, of the "Facultad de Agronomia" of La Plata, with the *Stilbum flavidum*, Cooke (Pistillaria flavida *Spegazz.*).

Secondly, the "Hollin" or "Fumagina," which appears as a kind of a soot covering the leaves of the coffee tree, and which is also a fungus (*Capnodium trichostomum*, Spegazz.); but in this case the fungus is only a secondary symptom, as it grows on a honey-like exudation of an insect (*Coccus*, scale insect, mealy bug) which settles on the tree.

Thirdly, several cases of distinct appearance, one due to the invasion of legions of caterpillars of a moth, the name of which I do not now remember, and others which were ascribed to over-cropping, to rot caused by imperfect drainage, or to the presence of foul wood in the soil.

These last were all more or less localised and disappeared after a time, but the two first are rather common in the neighbourhood of San José, where they re-appear every year with a gradually more epidemic tendency.

However, so far they cannot be said to have assumed a very alarming character, and the majority of the planters have not paid attention to them.

Owing to the excessive drought I have not been able to find any trace of the fungus on the diseased leaves; but these are sure to appear with the first rains in April and May, and if not too late for you, I shall gladly endeavour to obtain some good samples for you.

(Signed) H. PITTIER.

MR. CONSUL HARRISON TO ROYAL GARDENS, KEW.

British Consulate,
San José, Costa Rica,
February 28, 1899.

SIR,

IN accordance with a circular I received from Her Majesty's Minister in Central America, I sent His Excellency for despatch to the Royal Botanic Gardens, Kew, some pamphlets and notes on the diseases which have appeared in the coffee trees in this Republic.

I also forwarded some samples of leaves affected by the disease which the Government obtained for me.

I now under separate cover forward you direct some samples of diseased leaves, collected for me by Monsieur Pittier, and two photographs of trees affected. These trees have recovered, but in some instances look sickly.

I send these direct as Monsieur Pittier tells me the less they travel the better, as the fungus is liable to be rubbed off.

I have, &c.,
(Signed) PERCY C. HARRISON.

W. T. Thiselton-Dyer, C.M.G., F.R.S.,
Director, Royal Gardens, Kew.

The leaves are most frequently attacked, and within a short time become dry and fall to the ground, so that the tree is soon completely denuded of foliage. The growing berries also dry up and fall before maturity. New leaves are formed after some months of rest, usually to be again attacked in a similar manner, and after the consecutive loss of foliage for two or three years, the tree dies.

Diseased leaves are at once known by the presence of one—or usually several—more or less circular pale green, then brown, and finally whitish patches, which extend quite through the substance, appearing equally marked on both sides of the leaf. Grouped on these bleached spots, on the upper surface of the leaf, are several clear yellow drum-stick-like bodies standing erect. Each of these bodies, which are only about one-twelfth of an inch high, is a perfect fungus, bearing myriads of reproductive bodies or conidia on its globose head. One or more similar circular bleached spots bearing fungi also often occur on the berries.

On young twigs the bleached spots are elongated, varying from half to one inch in length. If the diseased patch completely girdles the twig, the portion above the wound dies.

Preventive measures.—Those recommended for the arrest of brown tea blight would probably be effective in the present instance also. Cleanliness is of primary importance. It is impossible for the disease to appear unless spores of the fungus are present in the neighbourhood, and the most effective means for reducing this possibility to a minimum is to collect and burn all diseased leaves and fruit that have fallen to the ground. Photographs received from Costa Rica showing coffee trees completely defoliated by the disease also show the fallen leaves lying in heaps under the trees.

Diseased twigs should be removed, otherwise, should sclerotia be formed, and the mycelium become perennial in the tissues, a yearly crop of conidia would be produced.

Description of Figures.

Fig. 1, coffee leaf showing the disease; nat. size. 2, single patch of disease; slightly magn. 3, two specimens of *Stilbum flavidum;* highly magn. 4, coffee berry showing one diseased patch; nat. size. 5, club-shaped conidiophores of the *Stilbum*, bearing conidia; × 400. 6, leaf of tea plant disease; nat. size. 7, section through a pustule of *Colletotrichum Camelliæ; a, a*, conidia; *b*, sterile coloured spines; × 400.

DCLIII.—FLORA OF BRITISH NEW GUINEA.

As announced in the *Bulletin* (1897, p. 112), Sir William MacGregor presented a small collection of dried plants, made by Mr. A. Giulianetti on Mount Scratchley. He has since presented another collection made by the same gentleman and Mr. A. C. English, chiefly in the Vanapa Valley and the Wharton Range.

The collection from Mount Scratchley consists of about 120 species of flowering plants, nine species of ferns, one *Isoetes*, 28 mosses, nine liverworts, and eight lichens. As some 2,500 species of vascular plants (flowering-plants and ferns) have already been recorded from New Guinea, this collection is numerically small; yet, from the great altitude at which most of the plants were found, it is a highly interesting one; and it contains a relatively large number of novelties. It is true that only two new generic types are included among them; but many generic novelties were not expected from such elevations, where the vegetation is of an alpine or temperate character, and largely composed of genera having a wide range.

Beginning with the cellular cryptogams, the lichens are only represented by quite common species. There are two new species —*Trachylejeunia Giulianettii* and *Cololejeunea hirta*—among the liverworts. On the other hand, nearly half of the mosses are new. They belong mostly to genera characteristic of humid mountainous regions within the tropics. Two out of the nine ferns are new, as well as one of the four Selaginellaceæ—*Isoetes neoguineensis*. As will be seen from the following enumeration, the flowering plants present a larger proportion of novelties, to say nothing of those species previously described by other botanists and not known to exist elsewhere. Better specimens of many of the undetermined species would doubtless considerably augment the number here described.

The smaller Vanapa Valley and Wharton Range collection, received in 1898, includes a remarkable new species of *Elæocarpus*—*E. aberrans*—and a new species of *Triplostegia*, a small genus of the Dipsaceæ, previously only known to inhabit the mountains of Northern India and Western China. There is also a considerable number of specimens of *Veronica*, which have all been provisionally referred to *V. Lendenfeldii*, but it is possible that more than one species is concerned. It is an instance of one very variable species, or several very closely allied species. Ferns are relatively numerous, and, though there are two new species of *Davallia*, they are mostly common Malayan types. One of these, *D. lanceolata*, differs widely from all previously described species, in having small lanceolate fronds two to four inches long.

In dealing with a fragment of a flora it is not safe to generalise; but apart from the fact that most of the endemic species belong to genera of wide distribution, their affinities are with those inhabiting the mountains of Celebes and Borneo. Indeed, some of the species are identical, and not known beyond the Archipelago; whilst others, endemic respectively in, say, Kinabalu, Borneo, and Mount Scratchley, British New Guinea, are very closely allied. Specially interesting among the new plants of this

collection are: *Oreomyrrhis linearis*, *Dolianthus vaccinioides*, *Gentiana Macgregorii*, *G. Giulianettii*, *Havilandia papuana*, and *Giulianettia tenuis*. Besides the foregoing, the grasses are particularly interesting botanically; all the species being regarded as new.

RANUNCULACEÆ.

Ranunculus amerophyllus, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2., p. 1.

Mount Scratchley, 10000–13000 ft., and Wharton Range, 11100 ft.

Ranunculus sp. *R. lappaceo*, Sm., var. *multiscapo*, Hook. f., affinis.

Wharton Range, 11100 ft.

VIOLACEÆ,

Schuurmansia Henningsii, *K. Schum. Fl. Kais. Wilh. Land*, p. 50.

Neneba, Mount Scratchley, about 4000 ft.

PITTOSPORACEÆ.

Pittosporum berberidoides, *Burkill;* species foliis coriaceis a *P. cornifolio*, A. Cunn., distinguenda, cui forsan affinis sit.

Rami recti, crassiusculi, cortice glabri rufescentes vel ætate cinerascentes, inter foliorum circulos cicatricibus, pedicellorum defectorum signis, notati. *Folia* obovata, admodum coriacea, persistentia, glabra, basi cuneata, apice abrupte cuspidata, $\frac{3}{4}$–$1\frac{1}{4}$ poll. longa, $\frac{1}{2}$–$\frac{3}{4}$ poll. lata, attrita, suavissima, venis numerosissimis conspicuis lateralibus in margine integro rigido conjunctis, primaria in apicem firmum excurrentia; petiolus $\frac{1}{4}$ poll. longus, rigidus. *Pedicelli* uniflori, $\frac{1}{2}$ poll. longi. *Flores* desunt. *Fructus* subglobosus, glaber, 2-carpellaris, rugosus, fuscus, 4 lin. longus, stylo $\frac{1}{2}$ lin. longo. *Semina* matura 2, nigra, $\frac{1}{2}$ lin. longa.

Mount Scratchley, 10000–13000 ft.

The pleasant scent of the leaves is derived from the resin of the canals which accompany the veins. The petiole contains 5 or 7 of these arranged in a crescent, the central ones being very large.

Pittosporum pullifolium, *Burkill;* species ex affinitate *P. bicoloris*, Hook., foliis facile distincta.

Rami juniores parce pubescentes, dein glabescentes et siccitate nigrescentes, crassiusculi. *Folia* coriacea, petiolata, oblanceo-obovata, glabra, siccitate supra purpureo-nigrescentia, infra pallidiora, basi rotundata, apice cuspidata, $1\frac{1}{2}$–2 poll. longa, 7–9 lin. lata, nervo primario conspicuo, nervis lateralibus utrinque 6–8 inter se prope marginem integrum arcuatim conjunctis; petiolus rigidus, 3–4 lin. longus. *Flores* ad apices ramorum in umbellas (in specimine unico nobis communicato 13-floras) dispositi; bracteæ fere glabræ, 2–5 lin. longæ, 1–$1\frac{1}{2}$ lin. latæ; pedicelli pilis

mollibus flavis tecti, 5–6 lin. longi. *Sepala* glabra, bracteis colore et contextu et figura simillima, ovata, acuta, 3 lin. longa, basi crassa quinquenervia. *Petala* distincta, lineari-lanceolata, 5–6 lin. longa, glabra, apice rotundata. *Staminum* filamenta 3 lin. longa, glabra. *Ovarium* pilis fulvis dense tectum, 2 lin. longum, $\frac{2}{3}$ lin. diam., 2-carpellare, placenta utraque 14–15-ovulata ; stylus 2 lin. longus, glaber ; stigma bilabiatum, labiis incurvis. *Fructus* deest.

Mount Scratchley, 10000–13000 ft.

HYPERICACEÆ.

Hypericum Macgregorii, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2., p. 2.

Mount Scratchley, 12200 ft.

TERNSTRŒMIACEÆ.

Trematanthera sp.

Mount Scratchley, 10000–13000 ft.

Saurauja rufa, *Burkill ; S. bifidæ*, Warb., affinis, foliis subtus rufo-tomentosis prima scrutatione jam dignoscenda.

Rami dense squamis sparse aculeis parvis tecti, cortice atro-brunnei ; aculei curvati, 1 lin. longi vel paullo longiores. *Folia* elliptica, basi et apice rotundata, margine leviter dentata, dentibus plerisque sub apice aculeum parvum gerentibus, supra fere glabra (aculeis paucis in nervis majoribus insidentibus) nitentia, subtus densissime rufo-tomentosa, 2–$3\frac{1}{4}$ poll. longa, $1\frac{1}{4}$–$1\frac{3}{4}$ poll. lata ; petiolus 2–5 lin. longus, squamis imbricatis tectus. *Pedunculi* solitarii, 3-flori, 2–$2\frac{1}{2}$ poll. longi, squamas modo ramorum gerentes ; pedicelli 2 lin. longi ; bracteæ late ovatæ, $\frac{1}{2}$ poll. longæ, dorso squamatæ ; bracteolæ duæ angustæ, alabastrum æquantes et circum eum arcuatæ, dorso tomentosæ etiamque setosæ. *Sepala* ovata, 3 lin. longa, similia, nisi quod partes alabastro clauso tectæ glabræ sunt ; superficies nudæ tomentosæ setosaeque. *Petala* basi cum staminum tubo connata, purpurea (?). *Antheræ* 40–50, externæ ad marginem tubi glabri sessiles fere basifixæ, internæ faciei tubi filamentis brevibus affixæ, aliquantulum versatiles. *Ovarium* depresso-globosum, 5-loculare, ovulis numerosissimis ; styli 5, distincti.

Neneba, Mount Scratchley, about 4000 ft.

MALVACEÆ.

Urena lobata, *Linn. ; Benth. Fl. Austral.* i., p. 206 ; *F. Muell. Papuan Pl.* i, p. 55.

Neneba, Mount Scratchley, about 4000 ft.

TILIACEÆ.

Elæocarpus aberrans, *Brandis ;* ab omnibus speciebus affinibus differt floribus tetrameris.

Partes novellæ minute puberulæ. *Folia* tenuiter coriacea, obovato-elliptica, undulata, sed integerrima, obtusa vel subacuta, venis secundariis utrinque 6–8 arcuatis ramosis intra marginem anastomosantibus. *Sepala* 4, 6 lin. longa, coriacea, utrinque puberula, libera, triangulari-lanceolata, nervo medio vix conspicuo. *Petala* 4, 8 lin. longa, plana, ovali-oblonga, apice vix latiora, irregulariter 7–9-dentata, utrinque puberula pilis intus rectis non reflexis ; nervi longitudinales plures, venis obliquis juncti. *Stamina* 50–60, toro lato planiusculo carnoso demum multiporoso inserta, arista antheram duplo superante, filamentis quam antheris paullo brevioribus. *Ovarium* tenuissime velutinum 3–4-loculare, dissepimentis apicem versus incompletis, stylo apice minutissime 3-fido. *Fructus* ignotus.

Mount Scratchley, 2000–4000 ft.

All the other species of this section, which will be defined in Sir Dietrich Brandis' forthcoming monograph of the genus, come from Madagascar.

Geraniaceæ.

Geranium dissectum, *Linn.; Benth. Fl. Austral.* i., p. 296 (G. pilosum, *Forst.; DC. Prod.* i, p. 642.

Wharton Range, 11000 ft.

Impatiens Herzogii, *K. Schum. Fl. Kais. Wilh. Land*, p. 56.

Neneba, Mount Scratchley, about 4000 ft.

Meliaceæ.

Dysoxylum sp.

Neneba, Mount Scratchley, about 4000 ft.

Leguminosæ.

Desmodium sinuatum, *Blume ex Baker in Hook. f. Fl. Brit. Ind.*, ii. p. 166.

Neneba, Mount Scratchley, about 4000 ft.

Rosaceæ.

Pygeum costatum, *Hemsley;* foliis *P. oocarpo*, Stapf, simillimum, sed racemis elongatis multifloris facile distinguitur.

Frutex vel arbor parva, dense ramosa, præter inflorescentiam glabra vel cito glabrescens, ramulis ultimis crassiusculis nigrescentibus, internodiis brevissimis. *Folia* petiolata, crassa, coriacea, ovata vel elliptica vel interdum obovata, 1–2¼ poll. longa, utrinque rotundata vel apice emarginata, supra costa atque venis insigniter impressis, subtus costa crassa valde elevata, venis lateralibus primariis utrinque 6–8 ; petiolus crassus, 2–3 lin. longus. *Flores* pubescentes, 3–4 lin. diametro, in racemos axillares quam folia longiores dispositi, distincte pedicellati, 5-meri. *Calycis* pubes-

centis lobi parvi, ovati ; tubus intus glaber. *Petala* majora, fere orbicularia, dense tomentosa. *Stamina* circa 20, glabra. *Ovarium* omnino glabrum, stigmate magno capitato. *Fructus* ignotus.

Mount Scratchley, 10000–13000 ft.

Pygeum papuanum, *Hemsley* ; foliis *P. brevistylo*, K. Schum., simillimum, sed ab hac specie recedit racemis plus quam duplo longioribus, pedicellis gracilioribus, calyce non circumscisso intus omnino glabro.

Arbor laxe ramosa, præter inflorescentiam glabra vel cito glabrescens, ramulis ultimis graciliusculis, internodiis circiter pollicaribus. *Folia* breviter petiolata, coriacea, ovato-lanceolata, 4–7 poll. longa, acuminata, costa supra impressa, subtus elevata, venis lateralibus primariis utrinque 6–7 subtus conspicuis prope marginem inter se arcuatim connexis. *Racemi* graciles, axillares, 3–4 poll. longi, pedicellis gracillimis 3–4 lin. longis. *Flores* 5-meri, pubescentes, 2–2½ lin. diametro. *Calycis* lobi oblongi, obtusi, tubum æquantes. *Petala* similia, sed paullo majora. *Stamina* circiter 20, filamentis filiformibus petala longe excedentibus glabris. *Ovarium* undique glabrum, stigmate capitato. *Fructus* non visus.

Mount Scratchley, 10000–13000 ft.

Rubus Ferdinandi-Muelleri, *Focke in Abh. Nat. Ver. Brem.* xiii., p. 165.

Mount Scratchley, 10000–13000 ft., and Wharton Range, 11000 ft.

Rubus moluccanus, *Linn.*; *Miq. Fl. Ind. Bat.* i. pt. 1, p. 382 ; *Benth. Fl. Austral.* ii., p. 430.

Neneba, Mount Scratchley, about 4000 ft.

Rubus rosæfolius, *Sm. Pl. Ic. Ined.* iii., t. 60 ; *Benth. Fl. Austral.* ii., p. 431 ; *F. Muell. Papuan Pl.* ii., p. 29.

Neneba, Mount Scratchley, about 4000 ft.

Potentilla microphylla, *D. Don* ; *Focke in Abh. Nat. Ver. Brem.* xiii., p. 164.

Mount Scratchley, 10000–13000 ft.

Potentilla papuana, *Focke in Abh. Nat. Ver. Brem.* xiii., p. 162. (P. leuconota, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 5. Non *D. Don*).

Mount Scratchley, 10000–13000 ft.

Potentilla parvula, *Hook. f. ex Stapf in Hook. Ic. Pl.*, t. 2294, *et in Trans. Linn. Soc.*, ser. 2, iv., p. 147.

Mount Scratchley, 10000–13000 ft., and Wharton Range, 11000 ft.

Potentilla sp. *P. papuanæ*, Focke, affinis.

Mount Scratchley, 10000–13000 ft.

Potentilla sp. *P. parvulæ*, Hook. f., affinis.

Mount Scratchley, 10000–13000 ft.

MYRTACEÆ.

Rhodomyrtus ?

Neneba, Mount Scratchley, about 4000 ft.

MELASTOMACEÆ.

Osbeckia sp.

Mount Scratchley, 12200 ft.

Otanthera bracteata, *Korth.*; *K. Schum. Fl. Kais. Wilh. Land*, p. 87 ; *Benth. Fl. Austral.* iii., p. 292.

Neneba, Mount Scratchley, about 4000 ft.

Medinilla spp. 2.

Neneba, Mount Scratchley, about 4000 ft.

ONAGRACEÆ.

Epilobium pedunculare, *A. Cunn.* ; *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 7.

Wharton Range, 11100 ft.

Jussiæa suffruticosa, *Linn.* ; *F. Muell. Papuan Pl.* i., p. 60 ; *Benth. Fl. Austral.* iii., p. 307.

Neneba, Mount Scratchley, about 4000 ft.

BEGONIACEÆ.

Begonia sp.

Mount Scratchley, 10000–13000 ft.

UMBELLIFERÆ.

Trachymene saniculæfolia, *Stapf in Hook. Ic. Pl.* t. 2308, *et in Trans. Linn. Soc.* ser. 2, iv., p. 167.

Mount Scratchley, 10000–13000 ft.

Falcaria laciniata, *DC. Prod.* iv., p. 110.

Neneba, Mount Scratchley, about 4000 ft.

Oreomyrrhis linearis, *Hemsley ;* a speciebus hactenus cognitis foliis linearibus indivisis gramineis differt. *Icones Plantarum*, t. 2590.

Mount Scratchley, 10000–13000 ft.

ARALIACEÆ.

Mackinlaya sp.

Neneba, Mount Scratchley, about 4000 ft.

Osmoxylon sp.

Without locality.

Rubiaceæ.

Argostemma sp.

Mount Scratchley, 10000–13000 ft.

Mussænda ferruginea, *K. Schum. Fl. Kais. Wilh. Land* p. 129.

Oriomo River, opposite Daru Island.

Psychotria sp.

Neneba, Mount Scratchley, about 4000 ft.

Cephaelis sp.

Mount Scratchley, 10000–13000 ft.

Cephaelis sp.

Neneba, Mount Scratchley, about 4000 ft.

Saprosma buxifolia, *C. H. Wright*; a speciebus reliquis foliis parvis oblanceolatis recedit.

Rami tenues, quadrangulares. *Folia* oblanceolata, obtusa, glabra, 9 lin. longa, 4 lin. lata; petiolus 1 lin. longus; stipulæ ovatæ, membranaceæ, deciduæ. *Flores* solitarii, axillares; bracteolæ 2, connatæ, calycis tubo approximatæ. *Calyx* 1 lin. longus, glaber, minute 5-dentatus, persistens. *Corollæ* tubus infundibuliformis, extus glaber, intus pubescens, 6 lin. longus; lobi 5–6, ligulati, valvati, 1–1½ lin. longi. *Stamina* 5–6; filamenta ½ lin. longa, corollæ faucibus affixa; antheræ subulatæ, filamentis æquilongæ. *Ovarium* 2-loculare; ovula solitaria, basilaria; stylus corollæ tubo æquilongus, ramis duobus 1 lin. longis. *Fructus* 4 lin. longus, 4–6-costatus.

Mount Scratchley, 10000–13000 ft.

Coprosma sp. *C. Hookeri*, Stapf, affinis.

Mount Scratchley, 10000–13000 ft.

Dipsaceæ.

Triplostegia repens, *Hemsley;* a speciebus hactenus cognitis habitu gracilitateque differt.

Herba perennis (?), caulibus repentibus radicantibus gracillimis (an speciminis depauperati ?) puberulis. *Folia* radicalia non visa, caulina opposita, longe graciliterque petiolata, membranacea, pilis paucissimis conspersa, oblonga, pinnatifida, cum petiolis circiter pollicaria, lobis ovatis sæpius 7 aristulatis. *Flores* cymosi, pauci, 6–9 aggregati. *Involucellum* dense nigro-glandulosum.

Wharton Range, 11100 ft.

This genus was previously only known to inhabit the mountains of Northern India and Western China.

Compositæ.

Myriactis bellidiformis, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 12.

Mount Scratchley, 10000–13000 ft.

Myriactis radicans, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 13.

Mount Scratchley, 10000–13000 ft.

Vittadinia Alinæ, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 11.

Mount Scratchley, 10000–13000 ft., and Wharton Range 11100 ft.

Vittadinia macra, *F. Muell.? in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 11.

Mount Scratchley, 10000–13000 ft.

Microglossa volubilis, *DC.; Martelli in Nuov. Giorn. Bot. Ital.* xv. (1883), p. 290.

Neneba, Mount Scratchley, about 4000 ft.

Anaphalis Mariæ, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 8.

Mount Scratchley, 10000–13000 ft.

Ischnea elachoglossa, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 13.

Mount Scratchley, 10000–13000 ft.

Hieracium sp.

Mount Scratchley, 10000–13000 ft.

Vacciniaceæ.

Agapetes costata, *C. H. Wright;* calycis tubo valde costato facile recognoscenda.

Ramuli teres, hirsuti. *Folia* lanceolata, basi rotundata, integra, supra glabra, subtus ad costam pilosa, marginibus pilosis, $1\frac{1}{2}$ poll. longa, 6 lin. lata; petiolus 2 lin. longus, pilosus. *Pedicelli* per paria axillares, incrassati, 8 lin. longi. *Calycis* tubus 3 lin. longus, glaber, costis 5 crassis; lobi breves, acuminati. Corolla tubulosa, glabra, $1\frac{1}{4}$ lin. longa; lobi 5, breves, triangulares, costis crassis. *Filamenta* 4 lin. longa; antheræ 4 lin. longæ, tubis apicalibus 6 lin. longis. *Stylus* staminibus paullo longior.

Mount Scratchley, 10000–13000 ft.

Vaccinium acutissimum, *F. Muell. in Trans. Roy. Soc. Victoria*, i., pt. 2, p. 15.

Mount Scratchley, 10000–13000 ft.

Vaccinium Macbainii, *F. Muell. in Trans. Roy. Soc. Victoria*, i., pt. 2, p. 17.

Mount Scratchley, 10000–13000 ft.

Vaccinium oblongum, *C. H. Wright; V. Macbainii*, F. Muell., accedit, foliis oblongis differt.

Caulis fruticosus. *Folia* oblonga, subintegra, subtus sparse punctata cæterum glabra, 1 poll. longa, 5 lin. lata, nervis supra insculptis, costa subtus conspicua; petiolus crassus, 2 lin. longus. *Racemi* breves, prope caulis apicem enati; bracteæ deltoideæ, 1 lin. longæ. *Calycis* tubus globosus, glaber; lobi rotundati, breviter acuminati, 1 lin. lati. *Corolla* 3 lin. longa; tubus brevis; lobi apice concavi, costa crassa. *Stamina* 10, corollæ æquilonga; filamenta 1 lin. longa, plana, pilosa; antheræ subtus acutæ et antice filamentis liberæ, tubis terminalibus leviter adherentibus antice magniporosis. *Stylus* staminibus paullo longior.

Mount Scratchley, 10000–13000 ft.

Vaccinium sp.

Mount Scratchley, 10000–13000 ft.

Ericaceæ.

Gaultheria mundula, *F. Muell. in Trans. Roy. Soc. Victoria*, i., pt. 2, p. 21.

Mount Scratchley, 10000–13000 ft., and Wharton Range, 11000 ft.

Rhododendron comptum, *C. H. Wright; R. retuso*, Benn., accedit, sed foliis non emarginatis, corollæ tubo latiore campanulato, lobis suborbicularibus patulis differt.

Rami tenues, plus minusve furfuracei. *Folia* obovato-oblonga, obtusa vel subacuta, minutissime crenulata, supra fere glabra, subtus dense lepidota, 9–12 lin. longa, 3–4 lin. lata, costa supra insculpta subtus elevata, nervis lateralibus celatis; petiolus crassus, 1 lin. longus. *Bracteæ* scariosæ, ovatæ, 9 lin. longæ, deciduæ. *Flores* 3–4-ni ad apices ramorum positi; pedicelli 9 lin. longi, minute pubescentes. *Calyx* parvus, obliquus, lobo uno sæpe subulato, reliquis obsoletis. *Corollæ* tubus campanulatus, 6 lin. longus, apice 3 lin. diam., extus sparse lepidotus, intus minute pilosus; lobi suborbiculares, 5 lin. diam. *Stamina* 10; filamenta glabra; antheræ 1 lin. longæ, poris 2 magnis introrsis. *Ovarium* lepidotum; stylus glaber; stigma leviter dilatatum.

Mount Scratchley, 10000–13000 ft.

Rhododendron nodosum, *C. H. Wright; R. Lochæ*, F. Muell., affine, sed foliis basi acutis, corollæ tubo longiore, lobis basi multo constrictis distinctum.

Caulis ramosissimus, nodis incrassatus, scrobiculatus. *Folia* oblonga vel obovata, basi acuta, apice acuta vel subobtusa, supra glabra nervis insculptis, infra lepidota nervis elevatis; petiolus 3–4 lin. longus. *Flores* 3–4-ni ad apices ramorum positi. *Pedicelli* 6–9 lin. longi, tenues, lepidoti. *Corollæ* tubus curvatus,

12–14 lin. longus, extus sparse lepidotus, intus pilosus; lobi plus minusve orbiculares. *Stamina* 10, paullo exserta; filamenta infra pilosa; antheræ $1\frac{1}{2}$–2 lin. longæ, poris terminalibus. *Ovarium* et *styli* basis pilosæ; stigma obliquum, leviter dilatatum.

Mount Scratchley, 10000–13000 ft.

Rhododendron papuanum, *Becc.? Malesia*, i., p. 200.

Mount Scratchley, 10000–13000 ft.

Rhododendron phæochitum, *F. Muell.? in Trans. Roy. Soc. Victoria*, i., pt. 2., p. 23.

Without locality.

Rhododendron sp. *R. longifloro*, Lindl., affine.

Without locality.

Rhododendron sp.

Mount Scratchley, 12200.

EPACRIDACEÆ.

Decatoca Spencerii, *F. Muell. in Trans. Roy. Soc. Victoria*, i., pt. 2., p. 26.

Mount Scratchley, 10000–13000 ft., and Wharton Range, 11100 ft.

Leucopogon Hookeri, *Sond. in Linnaea*, xxvi., p. 248; *Benth. Fl. Austral.* iv., p. 205.

Mount Scratchley, 10000–13000 ft.

Leucopogon papuanus, *C. H. Wright; L. melaleucoidi*, A. Cunn., distinctus calyce longiore, corolla profunde divisa, lobis acutis intus dense pilosis.

Frutex ramosus. *Ramuli* hispidi. *Folia* oblonga, acuta, glabra, integra, siccitate longitudinaliter striata, 5 lin. longa, $1\frac{1}{2}$ lin. lata; petiolus $\frac{1}{2}$ lin. longus. *Flores* 1–2, axillares, bracteis pluribus parvis imbricatis brunneo-marginatis. *Calyx* profunde 5-partitus, 1 lin. longus; lobi ovati, glabri. *Corolla* cylindrica, fauce breviter pilosa, $2\frac{1}{2}$ lin. longa; lobi brevissimi, obtusi. *Antherarum* loculi basi divaricati. *Ovarium* conicum.

Mount Scratchley, 10000–13000 ft.

MYRSINACEÆ.

Myrsine capitellata, *Wall.? in Roxb. Fl. Ind. ed. Carey*, ii., p. 295.

Mount Scratchley, 10000–13000 ft.

Myrsine papuana, *Hemsley;* ex affinitate *M. dasyphyllæ*, Stapf, sed minor, gracilior, foliis apice retusis diversa.

Frutex parva, ut videtur, undique glaber, ramulis ultimis gracilibus, internodiis brevissimis. *Folia* conferta, breviter petiolata, crassa, coriacea, obovato-spathulata, 6–12 lin. longa, retusa, sæpe supra medium obscure paucicrenata, deorsum attenuata, subtus inconspicue nigro-lineata, venis immersis obsoletis. *Pedicelli* brevissimi, recurvi. *Fructus* subglobosus, vix sesquilineam longus, pauciglandulosus, sepalis 4 minutis ovato-oblongis vel fere orbicularibus persistentibus.

Mount Scratchley, 10000–13000 ft.

STYRACEÆ.

Symplocos Englishii, *Hemsley;* species ex affinitate *V. buxifoliæ*, Stapf, a qua differt gracilitate, foliis minoribus, floribus brevissime pedicellatis, calycis lobis in margine glandulosis.

Frutex dense ramosus undique glaberrimus, ramulis subangulatis, internodiis quam foliis brevioribus. *Folia* brevissime petiolata, crassa, coriacea, ovata, elliptica, obovata, vel interdum fere orbicularia, 3–5 lin. longa, basi rotundata vel cuneata, apice rotundata vel subtruncata, supra medium sæpius 5–7-dentata vel crenata, dentibus callosis, venis primariis lateralibus utrinque 2 subtus sat conspicuis. *Flores* axillares, solitarii, 5-meri, cum pedicello brevi folia vix æquantes, basi bracteis 4 calycis lobis simillimis calyculum formantibus subtentis. *Calycis* lobi rotundato-deltoidei, ½–¾ lin. lati, margine glandulosi. *Petala* brevissime connata vel omnino soluta, oblongo-lanceolata, circiter 3 lin. longa, obtusa. *Stamina* 15–20, valde inæqualia, maxima quam petala breviora, filamentis crassiusculis teretibus inter se et cum petalis leviter adhærentibus. *Stylus* crassus, quam stamina longiora brevior. *Fructus* auguste ovoideus, 5–6 lin. longus, calycis lobis coronatus.

Mount Scratchley, 10000–13000 ft., and Wharton Range, 11100 ft.

Symplocos orbicularis, *Hemsley;* inter species papuanenses foliis rotundatis distincta.

Frutex dense ramosus, fere undique glaber, ramulis rigidis, internodiis quam foliis multo brevioribus. *Folia* brevissime petiolata, crassa, coriacea, lutescentia, orbicularia vel interdum late elliptica, obsolete remoteque crenulata, 6–15 lin. lata, venis subtus sat conspicuis. *Flores* racemosi, brevissime crasseque pedicellati, 5–6-meri, glabri, 6–7 lin. diametro; racemi axillares, rigidi, furfuracei, folia æquantes vel paullo superantes, bracteis obsoletis vel cito deciduis. *Calycis* lobi semiorbiculares, circiter lineam lati, margine minute ciliolati. *Petala* ima basi tantum cohærentia, late elliptica vel fere orbicularia, concava, circiter 2½ lin. longa. *Stamina* 15–20, inæqualia, inter se et cum petalis leviter cohærentia. *Fructus* ovoideus, 4–5 lin. longus.

Mount Scratchley, 10000–13000 ft.

Symplocos sp.

Mount Scratchley, 10000–13000 ft.

Apocynaceæ.

Alstonia scholaris, *R.Br.*; *F. Muell. Papuan Pl.* i, p. 70; *Benth. Fl. Austral.* iv., p. 312.

Daru Island.

Tabernæmontana pubescens, *R.Br.*; *F. Muell. Papuan Pl.* i, p. 91; *Benth. Fl. Austral.* iv., p. 311.

Without locality.

Loganiaceæ.

Dolianthus, *C. H. Wright*, (gen. nov.); *Hymenocnemidi*, Hook. f., proximus. *Flores* axillares, solitarii. *Calyx* æqualiter 4-lobatus, sine dentibus intermediis. *Corollæ* tubus infundibuliformis; lobi 4, valvati. *Stamina* 4, ad corollæ fauces subsessilia. *Ovarium* superius, 2-loculare; stylus filiformis; stigma incrassatum, minute 2-lobatum; ovula solitaria, erecta.—Arbuscula *habitu Coprosmæ, foliis coriaceis.*

D. vaccinioides, *C. H. Wright*; *(sp. unica).*

Rami lignosi, 1–2 lin. diam., primum pubescentes, demum glabri. *Folia* opposita, lanceolata, subobtusa, glabra, sempervirentes (?), penninervia, 5 lin. longa, 2 lin. lata; petioli $\frac{1}{2}$ lin. longi; stipulæ ovatæ, caducæ. *Pedicelli* $1\frac{1}{2}$ lin. longi. *Calyx* cupularis, glaber; lobi triangulares, obtusi. *Corollæ* tubus, 6 lin. longus, extus glaber, intus minute pubescens; lobi oblongi, acuti, 2 lin. longi. *Antheræ* sagittatæ, 1 lin. longæ; filamenta antheris æquilonga. *Ovarium* globosum; stylus corollæ æquilongus.

Mount Scratchley, 10000–13000 ft.

Fagræa sp.

Mount Scratchley, 10000–13000 ft.

Gentianaceæ.

Gentiana Ettingshauseni, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 27.

Mount Scratchley, 12200 ft., and Wharton Range, 11100 ft.

Gentiana (Chondrophyllum) Giulianettii, *Hemsley*; ex affinitate *G. Ettingshauseni*, F. Muell., a qua differt caulibus simplicibus, corollæ lobis latis brevibus.

Caules erecti, simplices, graciles, 1–2 poll. alti, atque folia omnino glabri. *Folia* tenuiter cartilaginea, sessilia, subpatentia, oblongo-ovata, circiter 2 lin. longa, apice aristata. *Flores* in apicibus caulium vel ramorum solitarii, sessiles, circiter 4 lin. longi. *Calyx* cartilagineus, quam corolla paullo brevior, dentibus erectis subulatis vel fere aciculatis tubo brevioribus. *Corolla* anguste infundibuliformis, lobis brevissimis ovatis apiculatis cum plicaturis fere truncatis alternantibus. *Genitalia* inclusa. *Capsula* deest.

Mount Scratchley, 12200 ft.

Gentiana (Chondrophyllum) Macgregorii, *Hemsl.* ; inter species affines foliis ramorum arctissime quadrifariam imbricatis insignis.

Planta perennis (?), minima, glaberrima, caulibus erectis vix pollicaribus vel interdum procumbentibus longioribus ramulos erectos gerentibus. *Folia* sessilia, imbricata, sæpe confertissima, cartilaginea, subulata, concavo-convexa, maxima $2\frac{1}{2}$–3 lin. longa, sed sæpius breviora, apice aristulata. *Flores* terminales, solitarii, sessiles, erecti, circiter 7 lin. longi. *Calyx* cartilagineus, lobis erectis subulatis tubum æquantibus. *Corolla* fere cylindrica, calycem tertia parte excedens, lobis brevibus erectis acutis cum plicaturis rotundatis fere obsolete denticulatis alternantibus. *Stamina* inclusa, filamentis deorsum leviter dilatatis. *Ovarium* clavatum vix stipitatum, stylo brevissimo, stigmatibus 2 sphæroideis. *Capsula* ignota.

Mount Scratchley, 12200 ft.

Boraginaceæ.

Myosotis ?

Without locality.

Havilandia papuana, *Hemsley* ; minor quam *H. borneensis*, Stapf, foliis deorsum vix attenuatis pedicellis cum floribus fere æquantibus.

Herba parva, perennis, procumbens, plus minusve setuloso-strigosa, caulibus ramulisque gracillimis. *Folia* spathulato-oblonga, maxima circiter 4 lin. longa, præcipue margine et subtus secus costam setulosa. *Flores* axillares, solitarii, vix 3 lin. diametro. *Calyx* setulosus, profunde 5-lobatus, lobis oblongis. *Corollæ* lobi orbiculares, undulati. *Squamæ* parvæ, rotundatæ. *Stamina* ac *stylus* inclusi. *Nuculæ* cuneato-lunatæ, læves, nitidæ.

Mount Scratchley, 12200 ft., and Wharton Range, 11100 ft.

Solanaceæ.

Solanum aviculare, *Forst. f. Prod.*, p. 18 ; *Benth. Fl. Austral.* iv., p. 447.

Neneba, Mount Scratchley, about 4000 ft.

Solanum dallmannianum, *Warb.? in Eng. Bot. Jahrb.* xiii., p. 415.

Neneba, Mount Scratchley, about 4000 ft.

Solanum torvum, *Sw.; K. Schum. Fl. Kais. Wilh. Land*, p. 117.

Neneba, Mount Scratchley, about 4000 ft.

Scrophulariaceæ.

Vandellia crustacea, *Benth; F. Muell. Papuan Pl.*, i., p. 90 ; *Benth. Fl. Austral.* iv., p. 496.

Neneba, Mount Scratchley, about 4000 ft.

Veronica Lendenfeldii, *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 29.

Mount Scratchley, 10000–13000 ft., and Wharton Range, 11100 ft.

Veronica sp.

Mount Scratchley, 12400 ft.

Gesneraceæ.

Dichrotrichum sp.

Neneba, Mount Scratchley, about 4000 ft.

Acanthaceæ.

Ptyssiglottis ?

Neneba, Mount Scratchley, about 4000 ft.

Graptophyllum hortense, *Nees; F. Muell. Papuan Pl.* ii., p. 33.

Neneba, Mount Scratchley, about 4000 ft.

Verbenaceæ.

Callicarpa longifolia, *Lam.; K. Schum. Fl. Kais. Wilh. Land*, p. 119; *Benth. Fl. Austral.* v., p. 57.

Neneba, Mount Scratchley, about 4000 ft.

Callicarpa sp.

Neneba, Mount Scratchley, about 4000 ft.

Labiatæ.

Plectranthus ?

Mount Scratchley, 10000–13000 ft.

Polygonaceæ.

Polygonum chinense, *Linn.; DC. Prod.* xiv., p. 130.

Neneba, Mount Scratchley, about 4000 ft.

Nepenthaceæ.

Nepenthes spp. 2.

Without locality.

Piperaceæ.

Piper excelsum, *Forst. f. Prod.*, p. 5.

Neneba, Mount Scratchley, about 4,000 ft.

Myristicaceæ.

Myristica lepidota, *Blume; Miq. Ann. Bot.* ii., p. 46.

Mount Scratchley, 10000–13000 ft.

Thymelæaceæ.

Drapetes ericoides, *Hook. f. in Hook. Ic. Pl.* t. 895; *F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 4.

Mount Scratchley, 10000–13000 ft.

Loranthaceæ.

Loranthus (Heteranthus) pachypus, *Burkill;* verisimiliter *L. pendulo*, Sieber, affinis, sed pedunculis crassis diversissimus.

Rami crassiusculi, glabri, cortice cinerei. *Folia* opposita, anguste obovata, apice rotundata, basi in petiolum 2–3 lin. longum angustata, $1\frac{1}{2}$–$1\frac{3}{4}$ poll. longa, 7–9 lin. lata, coriacea, glabra, nervis lateralibus utrinque duobus tribusve primarioque supra indistinctis infra nullo modo visibilibus. *Inflorescentiæ* foliis breviores, 1–4 ad axillas foliorum enatæ, omnino glabræ; pedunculus 5–7 lin. longus, ramos 3-floros 3–4 umbellatim gerens; pedicellus ultimus 2 lin. longus, fere 1 lin. diam., bractea minuta unguiformi terminatus, florem ad apicem oblique gerens; pedicelli juniores incurvati, sic modo flores obtegentes. *Calycis* tubus cupuliformis, margine minute 4-dentatus. *Perianthii* segmenta (matura non visa) 4, immatura facile separabilia, glabra. *Stamina* prope basin segmentorum perianthii immaturorum affixa. *Ovarium* ellipsoideum, 1 lin. longum; stylus, segmentis perianthii delapsis, 8 lin. longus.

Mount Scratchley, 10000–13000 ft.

One notices at once the swollen joints of the inflorescence which, when in bud or after the fall of the perianth, give it the appearance of a small *Opuntia*, whose last and shortest joint is in this case the bud or the ovary. These joints are narrowed at their insertion, and readily break off at this point.

Euphorbiaceæ.

Aporosa ?

Neneba, Mount Scratchley, about 4000 ft.

Urticaceæ.

Elatostema sp.

Neneba, Mount Scratchley, about 4000 ft.

Coniferæ.

Librocedrus papuana, *F. Muell.; Warb. in Engl. Bot. Jahrb.*, xvi., p. 12.

Neneba, Mount Scratchley, about 4000 ft.

Podocarpus cupressina, *R. Br. ex Mirb. in Mém. Mus. Par.*, xiii., p. 75; *Becc. Malesia*, i, p. 179.

Mount Scratchley, 10000–13000 ft., and Wharton Range, 11100 ft.

HYDROCHARIDACEÆ.

Ottelia alismoides, *Pers. Syn. Pl.* i, p. 400; *Benth. Fl. Austral.* vi., p. 527.

Iaro River, near Magibiri, in the Astrolabe Range.

ORCHIDACEÆ.

Dendrobium (Stachyobium) rigidifolium, *Rolfe*; ad *D. mirbelianum*, Gaud., accedit, recedit petalis latis sepalis æqualibus, labello minore.

Pseudobulbi teretes, $\frac{3}{4}$ ped. longi, polyphylli. *Folia* ovata, subobtusa, sessilia, coriacea, 1–1$\frac{3}{4}$ poll. longa. *Racemi* terminales, 2–2$\frac{1}{2}$ poll. longi, basi vaginis tubulosis imbricatis obtectæ. *Bracteæ* ovato-oblongæ, obtusæ, 4–6 lin. longæ. *Pedicelli* 1$\frac{1}{4}$ poll. longi. *Sepalum* posticum oblongum, breviter cuspidato-acuminatum, 10–12 lin. longum; lateralia triangulari-falcata, acuta, carinata, 10–12 lin. longa. *Petala* obovato-oblonga, obtusa, plana, 9–11 lin. longa, 4$\frac{1}{2}$ lin. lata. *Labellum* integrum, elliptico-oblongum, obtusum, recurvum, 6–7 lin. longum, lateribus erectis paullo undulatis, disco medio bicarinato. *Columna* lata, 1 lin. longa. *Mentum* breviter conicum, obtusum, 4 lin. longum.

Mount Scratchley, 12200 ft.

This species evidently belongs to the group containing *D. mirbelianum*, Gaud., and *D. veratrifolium*, Lindl., among which it is remarkable for its broad flat petals not longer than the sepals.

Dendrobium (Pedilonum) brevicaule, *Rolfe*; ex affinitate *D. Cuthbertsoni*, F. Muell., a quo differt floribus majoribus, labello cuneato-oblongo abrupte acuminato.

Pseudobulbi brevissimi, cæspitosi, oblongi, $\frac{1}{2}$–1 poll. longi, 2–4-phylli. *Folia* lineari-lanceolata, subacuta, $\frac{3}{4}$–4 poll. longa, 2–4 lin. lata. *Racemi* terminales, breves, 2–3-flori. *Bracteæ* late ovatæ, acutæ, concavæ, imbricatæ, 2–5 lin. longæ. *Pedicelli* $\frac{3}{4}$–1 poll. longi, trialati. *Sepalum* posticum oblongo-lanceolatum, acutum, 4–7 lin. longum; lateralia triangulari-ovata, acuta vel acuminata, carinata, 2–3$\frac{1}{2}$ lin. lata, basi cum columnæ pede in mentum longum extensa. *Petala* elliptico-lanceolata, acuta, 3–6 lin. longa. *Labellum* cuneato-oblongum, abrupte acuminatum, 7–11 lin. longum, 1$\frac{1}{2}$–3 lin. latum, disco lævi. *Columna* lata, 2–3 lin. longa. *Mentum* conico-elongatum, acutum, paululo incurvatum, 8–12 lin. longum.

Mount Scratchley, 12200 ft.

A remarkable alpine species with relatively very large flowers. It is one of a small group characterised by its very dwarf pseudobulbs, the other known species being *D. cerasinum*, Ridl., *D. puniceum*, Ridl., and *D. Cuthbertsoni*, F. Muell., all natives of New Guinea.

Acanthephippium javanicum, *Blume Bijdr.* p. 353 ; *Hook. in Bot. Mag.*, t. 4492 ; *Ridl. in Journ. Bot.* 1886, p. 354.

Neneba, Mount Scratchley, at about 4000 ft.

Glomera papuana, *Rolfe ;* ad *G. erythrosmam*, Blume, accedit, foliorum vaginis verrucosis, laminis triplo vel quadruplo minoribus differt.

Caules graciles vel crassiusculi, erecti, 4–6 poll. alti, polyphylli. *Folia* oblongo-vel lineari-lanceolata, oblique et inæqualiter bidentata, 1–1½ poll. longa, 1-3 lin. lata ; vaginæ tuberculato-verrucosæ. *Capitula* 7–9 lin. lata, 5–8-flora. *Bracteæ* late ovatæ, subacutæ, striatæ, 3–4 lin. longæ. *Pedicelli* 2–3 lin. longi. *Sepalum* posticum ovatum, subacutum, concavum, 1½ lin. longum ; lateralia late ovata, subacuta, concava, basi obliqua. *Petala* ovata, subacuta, concava, 1½ lin. longa. *Labellum* basi ample saccatum, obtusum, 2 lin. longum, 1 lin. latum ; lamina patens, ovato-oblonga, obtusa, ¾ lin. longa, lateribus medio plicato-reflexis, disco quinque-carinato. *Columna* clavata, 1¼ lin. longa, alis oblongis obtusis. *Mentum* saccato-oblongum, obtusum, 2 lin. longum.

Oriomo River.

An interesting addition to the genus, the two previously known species being *G. erythrosma*, Blume, from Java, and *G. montana*, Reichb. f., from Fiji.

Giulianettia, *Rolfe* (*gen. nov.*). *Sepala* patentia, subæqualia, lateralia basi ultra insertionem oblique extensa, connata, pone labelli calcarem laminam liberam breviter bilobam formantia. *Petala* sepalis angustiora. *Labellum* basi columnæ affixum et cum ea in tubum brevem connatum, basi longe calcaratum ; lamina erecta, integra, late cordato-ovata, concava, brevissima, medio crassiuscula. *Columna* brevissima, crassa ; clinandrium cavum, amplum, crenulatum. *Anthera* terminalis, opercularis, incumbens, convexa, 2–locularis ; pollinia non visa.—Herba *epiphytica, humilis.* Flores *terminales, solitarii, e medio bractearum imbricatarum paleaceo-scariosarum horizontale ad apices ramorum enascentes.*

Giulianettia tenuis, *Rolfe* (*sp. unica*). *Icones Plantarum*, t. 2616.

Mount Scratchley, 12200 ft.

A very interesting monotype, clearly allied to *Ceratostylis*, but differing in its large solitary flowers, in the auriculate bases of the lateral sepals united into a free limb behind the spur of the lip, not forming a mentum with the foot of the column, and in the long spur of the lip, which is about three times as long as the limb. The pollinia were missing from the flower examined.

Calanthe Englishii, *Rolfe ;* ad *C. clavatam*, Lindl., accedit, differt labello integro, calcare oblongo et duplo breviore.

Rhizoma repens. *Folia* lineari-lanceolata, acuminata, in petiolum attenuata, 1–1¾ ped. alta, 7–9 lin. lata. *Scapus* ¾ ped. altus, vaginis oblongis paucis obtectus. *Racemus* brevis, pauciflorus. *Bracteæ* deciduæ. *Pedicelli* 6–7 lin. longi. *Sepala* elliptico-oblonga, 4–5 lin. longa, posticum obtusum, lateralia

apiculata. *Petala* elliptico-oblonga, obtusa, 3–4 lin. longa. *Labellum* ad apicem columnæ affixum, integrum, late obovatum, obtusum, concavum, 3–4 lin. longum, basi venis 2 paullo incrassatis; calcar elliptico-oblongum, obtusum, 2 lin. longum. *Columna* clavata, $1\frac{1}{2}$ lin. longa.

Neneba, Mount Scratchley, at about 4000 ft.

The bracts fall before the flowers expand, as in other species of this affinity.

Podochilus densiflorus, *Blume in Rumphia*, iv., p. 44, tt. 192, fig. 5, 200, fig. B.; *Miq. Ann. Bot.* iii., p. 687.

Vanapa Valley, 2000–4000 ft.

Pterostylis papuana, *Rolfe;* ad *P. cucullatam*, R. Br., accedit, sed foliis angustioribus, sepalis petalisque longioribus, labello angustiore facile distinguitur.

Caulis gracilis, circa 7 poll. altus. Folia radicalia petiolata, ovato-oblonga, subacuta, $1–1\frac{1}{4}$ poll. longa, 5–6 lin. lata; petiolus 6–9 lin. longus; folia caulina sessilia, lanceolata, acuta, concava, 10–12 lin. longa, 2–3 lin. lata. *Flos* solitarius. *Bractea* lanceolata, acuta, concava, 10–11 lin. longa. *Sepalum* posticum oblongo-lanceolatum, acuminatum, incurvum, 2 poll. longum; lateralia basi lanceolata, 1 poll. longa, apice caudato-acuminata, 7–8 lin. longa. *Petala* falcato-lanceolata, acuta, $1\frac{3}{4}$ poll. longa. *Labellum* anguste lanceolatum, acuminatum, 9–10 lin. longum; appendix uncata, 2 lin. longa, apice penicillata. *Columna* 9 lin. longa; alæ dolabriformes, utrinque apice in dentem filiformem extensæ, basi in lobum oblongum extensæ.

Mount Scratchley, 12200 ft.

This discovery extends the range of the genus to New Guinea, it having previously been known only from Australia, New Zealand, and New Caledonia.

SCITAMINEÆ.

Alpinia sp., *A. macranthæ*, Scheff., affinis.

Neneba, Mount Scratchley, about 4000 ft.

Alpinia sp.

Mount Scratchley, 12200 ft., and Wharton Range, 11100 ft.

IRIDACEÆ.

Libertia pulchella, *Spreng. Syst.* i., p. 169; *Benth. Fl. Austral.* vi., p. 413.

Mount Scratchley, 12200 ft.

LILIACEÆ.

Cordyline terminalis, *Kunth; F. Muell. Papuan Pl.* i., p. 31; *Benth. Fl. Austral.* vii., p. 21.

Neneba, Mount Scratchley, about 4000 ft.

Astelia alpina, *R. Br.? F. Muell. in Trans. Roy. Soc. Victoria*, i., pt. 2, p. 35 ; *Benth. Fl. Austral.* vii., p. 11.

Mount Scratchley, 12200 ft., and Wharton Range, 11100 ft.

Dianella memorosa, *Lam.* (D. ensifolia, *Red.*) ; *K. Schum. Fl. Kais. Wilh. Land*, p. 14 ; *Benth. Fl. Austral.* vii., p. 16.

Neneba, Mount Scratchley, about 4000 ft.

Commelinaceæ.

Pollia sp.

Neneba, Mount Scratchley, about 4000 ft.

Palmæ.

Areca sp.

Without locality.

Adelonenga sp.

Without locality.

Orania sp., *O. regali*, Zipp., affinis.

Vanapa Valley, 2000–4000 ft.

Korthalsia sp.

Without locality.

In each case the specimens of the palms are only sufficient to determine the genus.

Pandanaceæ.

Pandanus sp.

Without locality.

Naiadaceæ.

Aponogeton monostachyon, *Linn. f.; Benth. Fl. Austral.* vii., p. 188.

Magibiri, Astrolabe Range, 2000 ft.

Eriocaulaceæ.

Eriocaulon sp.

Mount Scratchley, 12200 ft.

Cyperaceæ.

Cyperus pedunculosus, *F. Muell.; Benth. Fl. Austral.* vii., p. 272.

Vanapa Valley, 2000–4000 ft.

Scirpus fluitans, *Linn.; Benth. Fl. Austral.* vii., p. 326.

Mount Scratchley, 12200 ft.

Hypolytrum Parvibractea, *C. B. Clarke; H. prolifero*, Boeck. proxima, differt spicis rubro-brunneis, culmi vaginis aphyllis.

Culmus gracilis, 2 ped. longus, aphyllus ; nodi 3, distantes ; vaginæ in nodis sitæ, 2 poll. longæ, rubro-brunneæ, apice unilateraliter acutatæ. *Folia* basalia longa, $\frac{1}{2}$ poll. lata, 3-nervia, in marginibus modice spinulosa. *Panicula* composita, $1\frac{1}{2}$ poll. alta, 3 poll. lata, in pseudo-umbellam fere depressa, omnino rufobrunnea, bracteis $\frac{1}{3}$–$\frac{1}{2}$ poll. longis ovatis acutis. *Spicæ* longæ, ellipsoideæ, brunneæ. *Stylus* 2-fidus. *Nucis* rostrum conicum, nuci subæquilongum.

Mount Scratchley, 12250 ft.

Carpha alpina, *R. Br.; F. Muell. in Trans. Roy. Soc. Victoria*, i., pt. 2, p. 35 ; *Benth. Fl. Austral.* vii., p. 381.

Mount Scratchley, 12200 ft.

Schœnus curvulus, *F. Muell. in Trans. Roy. Soc. Victoria*, i., pt. 2, p. 36.

Mount Scratchley, 12200 ft.

Costularia paludosa, *C. B. Clarke;* (Schœnus paludosus, *Poir. Encyc. Suppl.*, ii., p. 251 ; Tricostularia paludosa, *Benth. Fl. Austral.*, vii., p. 382).

The generic name *Costularia* is published in Dur. et Schinz Consp. Fl. Afr., v., p. 658, with list of species and of distribution numbers.

Gahnia javanica, *Moritzi; F. Muell. in Trans. Roy. Soc. Victoria*, i., pt. 2, p. 36.

Mount Scratchley, 12200 ft.

Carex vulgaris, *Fries*, var., **gaudichaudiana**, *Benth. Fl. Austral.* vii., p. 442.

Without locality.

Carex sp., *C. lindleyanæ*, Nees, affinis

Wharton Range, 11100 ft.

Gramineæ.

Microlæna Giulianettii, *Stapf;* affinis *M. avenaceæ*, Hook. f., sed foliis brevibus rigidis, panicula angustissima stricta, spiculis rigidioribus diversa.

Gramen cæspitosum, glabrum, innovationibus extravaginalibus. *Culmi*, internodiis (summo ad 2 poll. longo excepto) omnibus brevissimis vel subnullis, foliis superati, tota longitudine vaginati. *Folia* omnia basalia ; vaginæ infimæ ad squamas reductæ, sequentes lateraliter compressæ, carinatæ, firmæ, striatæ ad os parce barbatæ, persistentes, vagina summa paniculæ basin amplectens ; ligulæ brevissimæ, truncatæ, membranaceæ ; laminæ lanceolatolineares, basi attenuatæ, sensim in vaginam abeuntes, apice breviter

acutæ, 4–6 poll. longæ, 2–4 lin. latæ, erectæ, firmæ, rigidæ, subtus superne scaberulæ, cæterum glabræ. *Paniculæ* strictæ, angustissimæ, 4–6 lin. longæ, folia æquantes vel paullo exsertæ; rami solitarii, remoti, appressi, ut rhachis compressa scaberuli, parce remoteque ramulosi; pedicelli 2–5 lin. longi, filiformes, apice clavati læviusculi. *Spiculæ* lineares, pallidæ, cum arista 10–11 lin. longæ. *Glumæ* minutæ, ovatæ, obtusæ, scariosæ, inferior $\frac{3}{8}$–$\frac{1}{2}$ lin., superior $\frac{3}{4}$–1 lin. longæ. *Valvæ* steriles, subcoriaceæ, lateraliter compressæ, carinatæ, lineares, sensim in aristam abeuntes, 7-nerves, superne scaberulæ, basi barbatæ, inferior circiter 4 lin., superior 6 lin. longæ; illius arista brevis, hujus valvam subæquans, utraque scabrida; valva fertilis admodum compressa, oblongo-linearis, subacuta, $3\frac{1}{2}$ lin. longa, tenuiter chartacea, 7-nervis; palea hyalina, enervis, 2 lin. longa. *Stamina* 2; antheræ 1 lin. longæ.

Mount Scratchley, 12200 ft.

Muehlenbergia sp.

Vanapa Valley, 2000–4000 ft.

Deyeuxia sclerophylla, *Stapf;* nulli speciei arcte affinis, glumis valvaque rigidis, arista e sinu orta distincta, potius sectionem novam *Sclerodeyeuxiam* sistens. *Icones Plantarum*, t. 2605.

Mount Scratchley, 12200 ft.

The glumes are as rigid as those of *Ammophila*, and the valve, though thinner, is still firmer than in any other *Deyeuxia* I have seen. The leaves are in structure very like the leaves of *Ammophila arenaria*, but the blades are more compressed. The awn springs from the sinus of the valve, whilst it is, I believe, always dorsal in the true Deyeuxias and reduced to a subterminal mucro or quite absent in *Ammophila*. This insertion of the awn in connection with the rigid side lobes and the shortly excurrent side nerves would bring the species near to *Pentapogon*, but in that genus the rhachilla is glabrous and the top of the ovary conspicuously appendaged. The great similarity of the structure of the blades of *Deyeuxia sclerophylla* and of the other grasses of Giulianetti's collection from Mount Scratchley, with the exception of *Microlæna*, is very singular, and indicative of great (probably periodical) dryness of the air.

Danthonia oreoboloides, *Stapf*; affinis *D. exiguæ*, Stapf (D. paucifloræ, *Buch.*, *non R. Br.;* Triodiæ exiguæ, *Kirk*), sed minor, tenuior, spiculis minoribus, valvis exsertis integris acuminatis distincta. *Icones Plantarum*, t. 2606.

Mount Scratchley, 12200 ft.

I have no doubt that this is the grass which Sir Ferdinand von Mueller described in *Trans. Roy. Soc. Victoria*, i., pt. 2, p. 38 and named provisionally *Festuca oreoboloides*.

Lophatherum gracile, *Brongn.; K. Schum. Fl. Kais. Wilh. Land*, p. 23.

Vanapa Valley, 2000–4000 ft.

Poa callosa, *Stapf*; affinis *P. papuanæ*, Stapf, sed foliis lævissimis ad laminæ basin callosis, valvis minus acuminatis 5-nervibus, paleis in carinis scaberulis quam valvis brevioribus distincta.

Gramen dense cæspitosum. *Culmi* erecti, graciles, 3 poll. longi, sub panicula scaberuli, cæterum læves, vix ad medium dense vaginatæ internodiis summo excepto brevissimis basalibus. *Folia* ad basin dense congesta, flabellatim imbricata, glaberrima, lævissima; vaginæ arctæ, leviter compressæ, laxe leviterque striatæ; ligulæ brevissimæ, acutæ, membranaceæ; laminæ setaceæ, lateraliter compressæ, canaliculatæ, apice brevissime et oblique acutatæ, 2 poll. longæ, rigidæ, erectæ. *Panicula* paupera, linearis, 9–10 lin. longa, stricta; rami inferiores geminati, rhachi appressi, 2–1-spiculati, filiformes, scaberuli; pedicelli ramis similes, crassiusculi, laterales circa 1 lin. longi. *Spiculæ* 2–1-floræ, oblongæ, fere 2 lin. longæ, pallidæ. *Glumæ* oblongo-ovatæ, acutæ, læves, inferior mediam spiculam æquans 3-nervis, superior paullo longior sub-5-nervis. *Valvæ* oblongæ, acutæ, $1\frac{2}{3}$ lin. longæ, rigidulæ, læves, 5-nerves. *Paleæ* quam valvæ paullo breviores, carinis asperulis. *Lodiculæ* inæqualiter 2-lobæ. *Antheræ* $\frac{1}{3}$ lin. longæ.

Mount Scratchley, 12200 ft.

Poa minimiflora, *Stapf*; affinis *P. epileucæ*, Stapf (Deyeuxiæ epileucæ, *Stapf*), sed foliis tenuiter setaceis, paniculis uberioribus, spiculis minoribus diversa. *Icones Plantarum*, t. 2608.

Mount Scratchley, 12200 ft.

Poa papuana, *Stapf*; affinis *P. minimifloræ*, Stapf, sed foliis minus tenuibus rigidioribus scaberulis, spiculis paullo majoribus, valvis acute acuminatis quam palea lævi paululo brevioribus diversa. *Icones Plantarum*, t. 2607.

Mount Scratchley, 12200 ft.

Poa papuana, *P. callosa*, *P. minimiflora* and *P. epileuca* form a small natural group, the affinity of which lies evidently with *Poa kerguelensis*, Hook. f. and *P. antarctica*, Stapf (Triodia antarctica, *Hook. f.*). In my paper on the flora of Kinabalu (*Trans. Linn. Soc.*, ser. 2. iv., p. 247), I have pointed out that the grass which I then described as *Deyeuxia epileuca* was "a very marked species the affinity of which lies rather with some Australian species (of *Deyeuxia*) than with any others, though it is far from being closely connected" and that "the spikelets come, perhaps, nearer to those of *D. gunniana*, Benth."; but I was then "still doubtful as to the true systematic position" of the grass (l. c. 105). The discovery of *Poa papuana* and *P. minimiflora* has now given me the key to it in the direction indicated above. This group of *Poæ* is well marked off from the rest by the minute 1–2-flowered spikelets and the firmer texture of the glumes and valves and will probably have to stand as a section of *Poa*. *Deyeuxia gunniana*, Benth., and the closely allied *D. breviglumis*, Benth., are in general habit strikingly similar to *P. papuana* and *P. minimiflora*, but the obtuse glumes and the minutely emarginate and mucronulate valves with nerves evanescent towards

the base point to a different genus. *P. papuana*, and, perhaps, also *P. minimiflora* are evidently the grasses which Sir Ferdinand von Mueller enumerated as *Festuca pusilla* (*Trans. Roy. Soc Victoria*, i., pt. 2, p. 38).

Festuca monantha, *Stapf*; affinis *F. papuanæ*, Stapf, sed culmis alte vaginatis foliis brevioribus, vaginis inferioribus brevibus, spiculis 1-floribus minoribus, glumis valvam æquantibus, ovario apice pilosulo diversa.

Gramen dense cæspitosum, innovationibus intravaginalibus. *Culmi* graciles, erecti, lævissimi, $\frac{1}{2}$ ped. alti, tota longitudine vaginati. *Folia* basi congesta; vaginæ lateraliter compressæ, obtuse carinatæ, firmulæ, 7–9-nerves, persistentes, basales $\frac{1}{2}$ poll. longæ; ligulæ brevissimæ, obtuse subauriculatæ; laminæ erectæ, setaceæ, arcte plicatæ, subacutæ, 4 poll. longæ, rigidæ, vix costatæ, læves. *Panicula* linearis, angustissima, 2 poll. longa, erecta; rami distantes, simplices, rhachi angulatæ scabræ appressæ, 3–2-spiculatæ, compressæ, longiores circiter $\frac{1}{2}$ poll. longæ; pedicelli crassiusculi, ramis similes, laterales ad 1 lin. longi. *Spiculæ* 1-floræ, fere $2\frac{1}{2}$ lin. longæ, virides; rhachillæ processus longiusculus, scaberulus. *Glumæ* lanceolatæ, acuminatæ, membranaceo-marginatæ, cæterum herbaceæ, inferior 2 lin. paullo longior 1–sub-3-nervis, superior paullo longior latior 3-nervis. *Valva* lineari-lanceolata (a latere) in setam scabram tenuem subæquilongam abeuns, superne scabridula, 5-nervis, glumam superiorem æquans vel ea subbrevior. *Palea* valvam æquans, carinis superne scabris. *Lodiculæ* fimbriatæ. *Antheræ* $\frac{1}{2}$–$\frac{5}{8}$ lin. longæ. *Ovarium* apice minute pilosulum. *Caryopsis* oblonga; hilum medium excedens.

Mount Scratchley, 12200 ft.

Festuca papuana, *Stapf;* affinis *F. magellanicæ*, Lam., inter species antarcticas, *F. ovinæ*, Linn., subsp. *F. frigidæ*, Hack., inter species orbis veteris; ab utraque foliis longis, valvarum nervis magis conspicuis; ab illa præterea vaginis fere ad os integris, ab hac laminis rigidioribus, panicula longiore, spiculis paullo majoribus diversa.

Gramen dense cæspitosum, innovationibus intravaginalibus crebris. *Culmi* erecti 1–2 ped. alti, lævissimi, vix ad medium vaginati. *Folia* numerosa ad basin subflabellatim arcte congesta; vaginæ lateraliter compressæ, obtusæ carinatæ, fere ad os integræ, exteriores 5–7- interiores 3- nerves, persistentes; ligulæ brevissimæ, obtuse subauriculatæ; laminæ erectæ, setaceæ, arcte plicatæ, acutissimæ, 4–9 poll. longæ, rigidæ, subpungentes, plus minusve tricostatæ, tenuiter scaberulæ vel fere læves. *Panicula* contracta, anguste linearis, 3–4 poll. longa; rhachis angulata, scabrida, stricta; rami distantes, rhachi appressi, subsimplices, inferiores ad $1\frac{1}{2}$ poll. longi et 5–8-spiculati, filiformes, scaberuli; pedicelli ramis similes, laterales 1–3 lin. longi. *Spiculæ* 3–4-floræ, oblongæ, $3\frac{1}{2}$ lin. longæ, purpureo- vel nigro-fuscescentes vel ad basin valvarum virides. *Glumæ* paullo inæquales, oblongo-lanceolatæ, carinatæ, 3-nerves, læves vel superne obscure asperulæ, inferior circiter 2 lin., superior $2\frac{1}{2}$ lin. longa. *Valvæ* dissitæ, lanceolatæ in aristam brevem abeuntes, superne scaberulæ vel sublæves, firmulae, 5-nerves, nervis prominulis. *Paleæ* valvas æquantes,

carinis scaberulis. *Lodiculæ* inæqualiter 2-lobæ, fimbriatulæ. *Antheræ* $\frac{3}{4}$ lin. longæ. *Ovarium* glabrum. *Caryopsis* lineari-oblonga, a dorso compressa, $1\frac{1}{2}$ lin. longa, antice vix sulcata; hilum ultra medium productum lineare.

Mount Scratchley, 12200 ft.

This is, no doubt, the plant enumerated by Sir Ferdinand von Mueller as *F. ovina* in *Trans. Roy. Soc. Victoria* i., pt. 2, p. 38.

Filices.

Gleichenia flagellaris, *Spreng.; Hook. & Baker, Syn. Fil.*, p. 14; *F. Muell. Papuan Pl.* ii., p. 35.

Without locality.

Hymenophyllum demissum, *Sw.; Hook & Baker, Syn. Fil.*, p. 61.

Mount Scratchley, 12400 ft.

Hymenophyllum dilatatum, *Sw.; Hook. & Baker, Syn. Fil.*, p. 62; *F. Muell. in Ann. Rep. Brit. N. Guin.* 1894, p. 126.

Vanapa Valley, 2000.

Hymenophyllum tunbridgense, *Sm.; F. Muell. in Trans. Roy. Soc. Victoria*, i. pt. 2, p. 40; *Benth. Fl. Austral.* vii., p. 706.

Mount Scratchley, 12200 ft.

Trichomanes apiifolium, *Presl; Hook. & Baker, Syn. Fil.*, p. 86; *Becc. Malesia*, iii., p. 34; *Benth. Fl. Austral.* vii., p. 703.

Vanapa Valley, 2000–4000 ft.

Trichomanes javanicum, *Blume; Hook. & Baker, Syn. Fil.*, p. 83; *Becc. Malesia*, iii., p. 33; *Benth. Fl. Austral.* vii., p. 702.

Vanapa Valley, 2000–4000 ft.

Trichomanes maximum, *Blume; Hook. & Baker, Syn. Fil.*, p. 86; *Becc. Malesia*, iii., p. 34.

Vanapa Valley, 2000–4000 ft.

Trichomanes pyxidiferum, *Linn.*; *Hook. & Baker, Syn. Fil.*, p. 81; *F. Muell. in Ann. Rep. Brit. N. Guin.* 1894, p. 126; *Benth. Fl. Austral.* vii., p. 703.

Vanapa Valley, 2000–4000 ft.

Trichomanes rigidum, *Sw.; Hook. & Baker, Syn. Fil.*, p. 86; *Becc. Malesia*, iii., p. 38; *Benth. Fl. Austral.* vii., p. 702.

Vanapa Valley, 2000–4000 ft.

Trichomanes trichophyllum, *Moore; Hook. & Baker, Syn. Fil.*, p. 466; *Becc. Malesia*, iii., p. 34.

Mount Scratchley, 12400 ft.

Davallia (Humata) bipinnatifida, *Baker;* a speciebus reliquis hujus subgeneris recedit frondibus lanceolato-deltoideis bipinnatifidis.

Rhizoma gracile, longe repens, paleis lanceolatis appressis membranaceis pallide brunneis. *Lamina* lanceolato-deltoidea, bipinnatifida, 5–6 poll. longa, deorsum 2 poll. lata, coriacea, glabra, rhachi primaria gracili nuda; pinnæ sessiles, inferiores reliquis majores, steriles oblongæ, obtusæ, deorsum parce breviter pinnatifidæ, basi cuneatæ; fertiles angustiores, profunde pinnatifidæ, lobis erecto-patentibus, inferioribus oblongis obtusis; venæ flabellatæ, perspicuæ; petiolus gracilis, nudus, 3–4 poll. longus. *Sori* ad lobos superiores solitarii, ad lobos inferiores 2–3-ni. *Indusium* semiorbiculare, persistens, firmum, glabrum, ½ lin. diam.

Vanapa Valley, 2000–4000 ft.

Davallia blumeana, *Hook.; Hook. & Baker, Syn. Fil.*, p. 93; *F. Muell. Papuan Pl.*, i., p. 77.

Vanapa Valley, 2000–4000 ft.

Davallia hirta, *Kaulf.; Hook. & Baker Syn. Fil.*, p. 100.

Vanapa Valley, 2000–4000 ft.

Davallia (Loxoscaphe) lanceolata, *Baker;* a speciebus reliquis hujus subgeneris recedit frondibus parvis lanceolatis.

Rhizoma gracile, breviter repens. *Lamina* lanceolata, bipinnata, 2–4 poll. longa, 6–8 lin. lata, glabra, viridia; rhachis nuda, straminea; pinnæ multæ, contiguæ, flabellato-pinnatæ, segmentis secundariis paucis anguste linearibus uninervatis 1–1½ lin. longis apice dilatatis; petiolus brevis, gracilis, stramineus, deorsum brunneo-tinctus. *Sori* solitarii, terminales, glabri. *Indusium* persistens, glabrum, viride.

Vanapa Valley, 2000–4000 ft.

Davallia pinnata, *Cav.; Hook. & Baker, Syn. Fil.*, p. 98.

Vanapa Valley, 2000–4000 ft.

Davallia repens, *Desv.; Hook. & Baker, Syn. Fil.*, p. 93; *Becc. Malesia* iii., p. 36.

Mount Scratchley, 12400 ft., and Vanapa Valley, 2000–4000 ft.

Lindsaya cultrata, *Sw.; Hook. & Baker, Syn. Fil.*, p. 105; *Becc. Malesia* iii., p. 36; *Benth. Fl. Austral.* vii., p. 719.

Vanapa Valley, 2000–4000 ft.

Lindsaya lobata, *Poir.; Hook. & Baker, Syn. Fil.*, p. 111; *F. Muell. Papuan Pl.* i., p. 78; *Benth. Fl. Austral.* vii., p. 720.

Vanapa Valley, 2000–4000 ft.

Asplenium amboinense, *Willd; Seem. Fl. Vit.*, p. 353; *Becc. Malesia* iii., p. 39.

Vanapa Valley, 2000–4000 ft.

Asplenium cuneatum, *Lam.; Hook. & Baker, Syn. Fil.*, p. 214; *F. Muell. Papuan Pl.* ii., p. 37.

Vanapa Valley, 2000–4000 ft.

Asplenium falcatum, *Lam.; Hook. & Baker, Syn. Fil.*, p. 208; *F. Muell. Papuan Pl.*, i., p. 16; *Benth. Fl. Austral.* vii., p. 746.

Mount Scratchley, 10000–13000 ft.

Asplenium longissimum, *Blume; Hook. & Baker, Syn. Fil.*, p. 199; *F. Muell. Papuan Pl.* ii., p. 37.

Vanapa Valley, 2000–4000 ft.

Asplenium tenerum, *Forst.; Hook. & Baker, Syn. Fil.*, p. 201; *Mett. in Miq. Ann. Bot.* ii., p. 234.

Vanapa Valley, 2000–4000 ft.

Didymochlæna lunulata, *Desv.; Hook. & Baker, Syn. Fil.*, p. 248.

Vanapa Valley, 2000–4000 ft.

Aspidium aristatum, *Sw.; Hook. & Baker, Syn. Fil.*, p. 255; *Benth. Fl. Austral.* vii., p. 757.

Vanapa Valley, 2000–4000 ft.

Nephrodium albo-punctatum, *Desv.; Hook. & Baker, Syn. Fil.*, p. 264.

Vanapa Valley, 2000–4000 ft.

Nephrodium (Lastrea) dissitifolium, *Baker*; ad *N. elongatum*, Hook. et Grev., accedit; differt pinnulis haud contiguis, indusio haud persistente.

Lamina oblongo-lanceolata, tripinnata, 1½–2 ped. longa, subcoriacea, glabra; rhachis nuda, gracilis, pallide brunnea; pinnæ inferiores majores, lanceolatæ, breviter petiolatæ, 4–5 poll. longæ; pinnulæ ovato-oblongæ, sessiles, obtusæ, basi cuneatæ, pinnatifidæ vel basi pinnatæ; segmenta tertiaria oblonga, obtusa, erecto-patentia; petiolus nudus, nitidus, pallide brunneus; venæ in segmentis tertiariis pinnatæ. *Sori* utrinque costam pinnularum uniseriati, haud contigui. *Indusium* reniforme, glabrum, cito deciduum.

Mount Scratchley, 10000–13000 ft.

Nephrodium patens, *Desv.*; *Hook. & Baker, Syn. Fil.*, p. 262; *Becc. Malesia* iii., p. 43.

Vanapa Valley, 2000–4000 ft.

Nephrolepis acuta, *Presl*; *Hook. & Baker, Syn. Fil.*, p. 301; *Becc. Malesia* iii., p. 44.

Vanapa Valley, 2000–4000 ft.

Polypodium cucullatum, *Nees*; *Hook. & Baker, Syn. Fil.*, p. 324 *Becc. Malesia* iii., p. 47.

Wharton Range, 11100 ft.

Polypodium undosum, *Baker in Journ. Bot.* 1890, p. 108; *F. Muell. in Ann. Rep. Brit. N. Guin.* 1894, p. 126.

Mount Scratchley, 10000–13000 ft.

Polypodium obliquatum, *Blume*; *Hook. & Baker, Syn. Fil.*, p. 328; *F. Muell. in Ann. Rep. Brit. N. Guin.* 1894, p. 126.

Without locality.

Polypodium Phymatodes, *Linn.*; *Hook. & Baker, Syn. Fil.*, p. 364; *F. Muell. Papuan Pl.* i., p. 48; *Benth. Fl. Austral.* vii., p. 769.

Neneba, Mount Scratchley, about 4000 ft.

Gymnogramme quinata, *Hook.*; *Hook. & Baker, Syn. Fil.*, p. 387; *Becc. Malesia* iii., p. 49.

Vanapa Valley, 2000–4000 ft.

Acrostichum blumeanum, *Hook.*; *Hook. & Baker, Syn. Fil.*, p. 423; *Becc. Malesia* iii., p. 51.

Vanapa Valley, 2000–4000 ft.

Acrostichum conforme, *Sw.*; *Hook. & Baker, Syn. Fil.*, p. 401; *Benth. Fl. Austral.* vii., p. 778.

Without locality.

Acrostichum spicatum, *Linn.*; *Hook. & Baker, Syn. Fil.*, p. 424; *Becc. Malesia* iii., p. 51; *Benth. Fl. Austral.* vii., p. 780.

Without locality.

Todea (Leptopteris) alpina, *Baker*; ad *T. Fraseri*, Hook. et Grev., accedit; differt frondibus deorsum angustatis, pinnulis profunde pinnatifidis.

Lamina oblongo-lanceolata, 1½–2 ped. longa, medio 8–9 poll. lata, ad basin sensim attenuata, membranacea, nigrescentia, glabra, rhachi nuda; pinnæ lanceolatæ, sessiles, centrales 4–4½ poll. longæ 1 poll. latæ, rhachi anguste alata, inferiores sensim minores deflexæ; pinnulæ lanceolatæ, sessiles, erecto-patentes, profunde pinnatifidæ; segmenta tertiaria linearia, integra, uninervata; petiolus nudus, brevis. *Sori* pauci, irregulariter sparsi.

Mount Scratchley, 10000–18000 ft.

Marattia fraxinea, *Sm.*, var., **sambucina,** (*Blume*); *Hook. & Baker, Syn. Fil.*, pp. 440, 441.

Vanapa Valley, 2000–4000 ft.

Ophioglossum pendulum, *Linn.*; *Hook. & Baker, Syn. Fil.*, p. 446.

Vanapa Valley, 2000–4000 ft.

LYCOPODIACEÆ.

Lycopodium cernuum, *Linn.*; *Baker, Fern Allies*, p. 23.

Vanapa Valley, 2000–4000 ft.

Lycopodium Phlegmaria, *Linn.; Baker, Fern Allies*, p. 22.
Locality uncertain.

Lycopodium scariosum, *Forst.; Baker, Fern Allies*, p. 29.
Without locality.

SELAGINELLACEÆ.

Selaginella caulescens, *Spring; Baker, Fern Allies*, p. 94.
Vanapa Valley, 2000–4000 ft.

Selaginella viridangula, *Spring?; Baker, Fern Allies*, p. 92.
Vanapa Valley, 2000–4000 ft.

Selaginella Wallichii, *Spring; Baker, Fern Allies*, 90.
Vanapa Valley, 2000–4000 ft.

Isoetes neoguineenis, *Baker;* ad sectionem *Subaquaticas* pertinet; ad *I. Muelleri*, A. Br., et *I. Kirkii*, A. Br., accedit; differt macrosporis lævibus, velo nullo.

Cormus 3–4-lobus. *Folia* densa, numerosa, atroviridia 2–3 poll. longa, sursum subteretia deorsum applanata, basi abrupte dilatata, stomatibus paucis. *Sporangia* oblonga, brunnea, punctata, velo nullo. *Macrosporæ* globosæ, albæ, inter costas elevatas læves. *Microsporæ* oblongæ, pallide brunneæ, minute tuberculatæ.

Mount Scratchley, 10000–13000 ft.

MUSCI.

Acanthocladium Armitii, *Broth. & Geheeb in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 100.
Wharton Range, 11100 ft.

Acanthocladium complanatulum, *Broth.* (Hypnum complanatulum, *C. Müll. in Journ. Mus. Godeffroy*, vi., p. 89).
Without locality.

Acrocladium politum, *Mitt. in Journ. Linn. Soc.*, xii., p. 531.
Wharton Range, 11100 ft.

Daltonia Macgregorii, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 95.
Mount Scratchley, 12200 ft.

Ectropothecium (Vesicularia) angustirete, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 96.
Astrolabe Range, 2000 ft.

Ectropothecium laticuspes, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 98.
Without locality.

Ectropothecium longicollum, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 96.

Without locality.

Ectropothecium Macgregorii, *Broth. & Geheeb in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 97.

Without locality.

Ectropothecium tapes, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 98.

Without locality.

Garovaglia Micholitzii, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 92.

Without locality.

Leptostomum intermedium, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 86.

Mount Scratchley, 12200 ft.

Leucophanes Giulianettii, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 72.

Without locality.

Macromitrium macrosporum, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 80.

Mount Scratchley, 12200 ft.

Microthamnium macrocarpum, *Jaeg. Adum.* ii., p. 497.

Mount Scratchley, 12400 ft.

Mniodendron fusco-aciculare, *Broth.* (Hypnodendron fusco-aciculare, *C. Müll. in Uhlworm & Haenl. Bibl. Bot.*, ii., Heft 13, p. 10. t. 8.)

Mount Scratchley, 12400 ft.

Neckera (Nanocarpidium) Giulianettii, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 24.

Without locality.

Papillaria floribunda *C. Müll. in Linnæa*, xl., p. 267.

Without locality.

Pterobryum piliferum, *Broth. & Geheeb in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 93.

Without locality.

Schistomitrium breviapiculatum, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 72.

Without locality.

Schlotheimia Macgregorii, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 82.

Without locality.

Schlotheimia pilicalyx, *Broth. & Geheeb in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, xxxiv., p. 61.

Wharton Range, 11100 ft.

Symblepharis obliqua, *Brotherus* (Holomitrium obliquum, *Salmon in Journ. Linn. Soc.* xxxiii., p. 500) ; species distinctissima, a *S. perichætiali*, Wils., statura robustiore et theca asymmetrica sæpe curvatula facile dignosenda.

Planta robusta, cæspitosa, cæspitibus compactis 3–4 cm. altis ferrugineo-tomentosis lutescentibus. *Caulis* erectus, fere ad apicem tomentosus, dense foliosus, dichotome ramosus, ramis erectis fastigiatis. *Folia* sicca crispata, humida erecto-patentia, e basi oblonga sensim longe lanceolato-subulata, acuta, marginibus erectis integris vel summo apice parcissime denticulatis, nervo basi circa ·15 mm. lato cum apice evanido ; cellulæ incrassatæ, subquadratæ, basilares lineares, alares numerosæ, magnæ, fusco-aureæ, omnes læves. *Bracteæ perichætii* in cylindrum exsertum convolutæ, a basi longe vaginante longe subulatæ, subula subintegra. *Seta* 2 cm. alta, flexuosula, tenuis, lutea vel lutescenti-rubra. *Theca* erecta, asymmetrica, recta vel curvatula, cylindrica, fusca, lævissima ; peristomium simplex ; exostomii dentes 16, per paria approximati, usque ad basin bifidi, cruribus cohærentibus papillosis, purpurei ; operculum e basi conica longe oblique rostratum. *Sporæ* ·017–·020 mm., olivaceæ, papillosæ.

Wharton Range, 11100 ft.

Syrrhopodon adpressus, *Broth. in Öfvers. Finsk. Vet.-Soc. Förh. Helsingfors*, lv., p. 78.

Without locality.

Syrrhopodon croceus, *Mitt. in Journ. Linn. Soc.*, iii., Suppl., p. 41.

Oriomo River.

Tetraplodon mnioides, *Bruch & Schpr. Bryol. Eur.*, t. 289.

Mount Scratchley, 12200 ft.

Thuidium cymbifolium, *Dozy & Molkenb. Bryol. Javan.* ii., p. 115, t. 221.

Without locality.

Thuidium glaucinum, *Bosch & Lac. in Dozy & Molkenb. Bryol. Javan.* ii., p. 117, t. 222.

Without locality.

Trichosteleum hamatum *Jaeg. Adum.* ii., p. 486.

Without locality.

Trichosteleum papillatum, *Paris in Actes Soc. Linn. Bordeaux*, li., p. 349.

Oriomo River.

Zygodon Reinwardtii, *A. Br. in Bryol. Eur.* iii., Zygodon, p. 9.

Without locality.

Hepaticæ.

Cololejeunea hirta, *Steph. sp. n.*

Planta dioica, pusilla, in sicco flavicans, foliis vivis irrepens et subcæspitans. *Caulis* tenuis, divaricatim multiramosus. *Folia* pro planta magna, plana, contigua, recte patula, juniora erecta, falcato-decurva, e basi conico angustata falcato-ovata, i.e. margine antico multo magis arcuato, apice obtusa, dentibus majoribus minoribusque alternantibus irregulariter dentata, dentibus conicis apice papillatim incrassatis. *Cellulæ* folii apicales 17 μ, medianæ 17 × 25 μ, basales 17 × 50 μ, trigonis nullis, antice papilla magna singula centrali ornatæ. *Lobulus* valde inflatus, folio subtriplo brevior, e basi angusta oblongus, carina lævi arcuata levi sinu in folium excurrente apice oblique truncatus, angulo acuto decurvo vix visibili. *Stylus* basalis brevis, unicellularis, cylindricus, facile evanidus. *Perianthia* in pinnis primariis terminalia, uno latere innovata, ex angusta basi oblonga, apice truncato rotundata, plus duplo longiora quam lata, post fructus emissionem fere clavata, medio supero profunde 5-plicata, plicis posticis divergentibus, ad medium perianthii decurrentibus, omnibus conice dentatis, rostro parvo. *Folia floralia* perianthio duplo breviora, anguste spathulata, ut caulina dentata, lobulo duplo angustiore parum soluto et parum breviore, margine integerrimo. Reliqua ignota.

Vanapa Valley, 2000–4000 ft.

Frullania nobilis, *Steph. in Hedwigia*, 1894, p. 154.

Mount Scratchley, 12200 ft.

Herberta Wichuræ, *Steph. in Hedwigia*, 1895, p. 45.

Mount Scratchley, 12200 ft.

Lepidozia Neesii, *Lindenbg. in Gott. Sp. Hepat.*, p. 212.

Mount Scratchley, 12200 ft.

Lophocolea beecheyana, *Tayl. in Hook. Lond. Journ. Bot.*, 1846, p. 365.

Without locality.

Lophocolea ciliolata, *Mitt. in Journ. Linn. Soc.* v., p. 99.

Without locality.

Plagiochila brauniana, *Nees in Lindenbg. & Gott. Sp. Hepat.*, p. 117, t. 24.

Mount Scratchley, 12200 ft.

Thysanolejeunea lanceolata, *Steph. in Hedwigia*, 1896, p. 139.

Vanapa Valley, 2000–4000 ft.

Trachylejeunea Englishii, *Steph. sp. n.*

Planta dioica, minor, fusco-viridis, in filicis fronde repens. *Caulis* pro planta validus, viridis, regulariter pinnatus, pinnulis subbrevibus. *Folia* contigua, subrecte patula, parum concava, late ovata, subacuta, basi antica longe soluta caulique vix incumbentia. *Cellulæ* marginales parvæ (8 μ), irregulariter papilloso-prominulæ ideoque optime crenatæ, medianæ 17 μ, basales 25×25 μ, trigonæ minimæ. *Lobulus* bullatim inflatus, folio triplo brevior, carina valde arcuata, in sinu angusto abrupte desinens, e lata basi sensim angustatus, apice oblique truncatus, angulo obtuso, sæpe ad plicam parvam reductus vel omnino nullus. *Amphigastria* caule parum latiora, a caule recte patula, subrotunda, integerrima, transverse inserta; cellulæ 12 μ, angulares magnæ pellucidæ 17×34 μ, trigonis nullis, ad $\frac{1}{2}$ bifida, lobis late conicis acutis. *Perianthia* in ramulis pseudo-lateralia, breviter clavata (plus duplo longiora quam lata), tertio supero quinque-plicata, plicis obtusis, dentibus conicis irregularibus scabra, rostro parvo. *Folia floralia* inæqualia, caulinis similia crenata sed longiora, ex angusta basi obovato-oblonga, acuta, lobulo magno ligulato obtuso folio suo parum breviore et parum soluto; amphigastrium florale obovatum, ut lobuli integerrimum, ad $\frac{1}{3}$ bifidum, sinu recto-acuto, lobis late conicis acutis. Reliqua desunt.

Vanapa Valley, 2000–4000 ft.

LICHENES.

From Mount Scratchley.

Alectoria ochroleuca *Nyl. Prod. Lich.*, p. 47.

Cetraria sanguinea, *Müll.-Arg. in Journ. Linn. Soc.* xxix., p. 218.

Cladonia sp.

Sphærophoron australe, *Laur.? in Linnæa*, ii., p. 44.

Stereocaulon alpinum, *Laur. ex E. Fries, Lichenogr. Eur.*, p. 204.

Stictina hirsuta, *Nyl. Lich. Scand.*, p. 95.

Stictina multifida, *Nyl. Syn. Lich.*, p. 363, in obs.

DCLIV.—NEW ORCHIDS.—DECADES 23 and 24.

With the exception of the two species of *Vanilla* at the end, the orchids described below are from North-east Celebes, and were collected and presented by Dr. S. H. Koorders, of the Forest Administration of Java. A rough list of orchids is published in

his book entitled : *Verslag eener Botanische Dienstreis door de Minahasa*, pp. 321–326 ; and the localities here given were extracted therefrom ; the same numbers being cited as are attached to the specimens.

221. **Microstylis repens**, *Rolfe ;* ad *M. commelynifoliam*, Zoll., accedit, sed foliis subdistantibus longe petiolatis, petalis lineari-oblongis, et labelli auriculis multo brevioribus differt.

Rhizoma repens. *Folia* longe petiolata ; limbus late ovatus vel cordato-ovatus, acutus, 4–8 lin. longus, 3–7 lin. latus ; petiolus circa 6 lin. longus, margine membranaceus, basi in vaginam tubulosam caulem amplectentem dilatatus. *Scapi* graciles, circa 5 poll. longi ; racemi 1–1¼ poll. longi, laxiflori ; bracteæ ovato-lanceolatæ, acutæ, reflexæ, ¾–1 lin. longæ ; pedicelli graciles, 2–2½ lin. longi. *Sepala* ovato-oblonga, obtusa, 1¼ lin. longa. *Petala* lineari-oblonga, obtusa, 1¼ lin. longa. *Labellum* 1½ lin. longum, subtrilobum, basi biauriculatum ; lobi laterales breves, apice dentibus parvis paucis instructi ; intermedius oblongus, bidentatus ; auriculæ semiovato-oblongæ, obtusæ, ½ lin. longæ. *Columna* ¼ lin. longa.

NORTH-EAST CELEBES. Lokon, Goenoeng Klabat, Minahassa, *Koorders*, 29537.

222. **Microstylis cordifolia**, *Rolfe ;* affinis *M. commelynifoliæ*, Zoll., a qua differt foliis majoribus, petalis oblongo-lanceolatis, labelli lobo intermedio angusto et multo longiore, auriculis multo latioribus.

Rhizoma repens. *Folia* petiolata, limbus late cordatus, acutus vel breviter acuminatus, ¾–1 poll. longus, ½–¾ poll. latus ; petiolus 6–9 poll. longus, basi in vaginam tubulosam caulem amplectentem dilatatus. *Scapi* graciles, circa 9 poll. longi ; racemi 3–4 poll. longi, multiflori ; bracteæ lanceolatæ, acuminatæ, reflexæ, 1–1½ lin. longæ ; pedicelli graciles, 1 lin. longi. *Sepala* ovata, subobtusa vel apiculata, 1–1¼ lin. longa. *Petala* oblongo-lanceolata, subacuta, 1–1¼ lin. longa. *Labellum* 1½ lin. longum, trilobum, basi biauriculatum ; lobi laterales breves, apice profunde fimbriati ; intermedius oblongus, bidentatus ; auriculæ semiovato-triangulares, subobtusæ, ½ lin. longæ. *Columna* ⅓ lin. longa.

NORTH-EAST CELEBES. Lokon, Goenoeng Klabat, Minahassa, *Koorders*, 29539.

223. **Dendrobium (Sarcopodium) parvulum**, *Rolfe ;* species minuta, a D. pusillo, Blume, segmentis acutis et labello non undulato distinguenda.

Rhizoma repens, validum. *Pseudobulbi* sessiles, ovoidei, 2 lin. longi, diphylli. *Folia* sessilia, ovata vel ovato-oblonga, acuta vel apiculata, 3–5-nervia, 3–5 lin. longa, 1½–2½ lin. lata. *Pedicelli* 5 lin. longi, lateraliter acute angulati vel subalati. *Sepalum* posticum ovato-lanceolatum, acutum, 3½ lin. longum ; lateralia subsimilia, leviter falcata, obtuse carinata, basi in mentum oblongum leviter incurvum obtusum extensa. *Petala* oblongo-lanceolata,

acuta, concava, 3 lin. longa. *Labellum* oblongo-lanceolatum, apice acuminatum, recurvum, $3\frac{1}{2}$ lin. longum, margine incurvum; discus tricarinatus. *Columna* $1\frac{1}{4}$ lin. longa. *Mentum* 3 lin. longum.

NORTH-EAST CELEBES. Goenoeng Klabat, Minahassa, *Koorders*, 29565.

Remarkable for its very dwarf habit.

224. **Cirrhopetalum Koordersii**, *Rolfe; C. Thouarsii*, Lindl. simile, sed foliis multo latioribus et petalis obtusis distinctum.

Rhizoma repens, validum. *Pseudobulbi* subdistantes, tetragoni, 1 poll. longi. *Folia* breviter petiolata, elliptico-oblonga, obtusa, $5\frac{1}{2}$ poll. longa, $1\frac{3}{4}$ poll. lata. *Pedicelli* 7 lin. longi. *Sepalum* posticum elliptico-oblongum, obtusum, $3\frac{1}{2}$ lin. longum, margine integrum vel minutissime serrulatum, apice seta filiformi $2\frac{1}{2}$ lin. longa instructum; lateralia supra basin fere ad apicem connata, circa 17 lin. longa, 4 lin. lata, lobis subacutis. *Petala* falcato-oblonga, obtusa, serrulata et longe ciliata, 2 lin. longa. *Columna* lata, $1\frac{1}{2}$ lin. longa, dentes falcato-lineares, acuminati, 1 lin. longi.

NORTH-EAST CELEBES. Oerwoud Totok, Minahassa, *Koorders*, 29566.

Very nearly allied to the Mascarene and Polynesian *C. Thouarsii*, Lindl., though apparently distinct. The specimen is not quite complete.

225. **Eria (Eriura) tricuspidata**, *Rolfe;* ad *E. iridifoliam*, Hook. f., accedit, differt foliis angustis, labello lato subæqualiter tricuspidato-trilobo.

Pseudobulbi erecti, teretes, 6 poll. longi vel ultra, polyphylli. *Folia* elongato-linearia, apice obliqua, acuta vel rarius emarginata, $4\frac{1}{2}$–8 poll. longa, 3–7 lin. lata. *Racemi* subterminales, graciles, cinereo-pubescentes, 5–$6\frac{1}{2}$ poll. longi, multiflori; bracteæ late triangulari-ovatæ, apiculatæ, $\frac{3}{4}$ lin. longæ; pedicelli $2\frac{1}{2}$–3 lin. longi, ut flores cinereo-pubescentes. *Sepalum* posticum ovatum, subobtusum, concavum, $1\frac{1}{4}$–$1\frac{1}{2}$ lin. longum; lateralia late ovata, subobtusa, cum basi columnæ in mentum saccatum extensa. *Petala* elliptico-oblonga, apiculata, membranacea, $1\frac{1}{4}$–$1\frac{1}{2}$ lin. longa. *Labellum* $1\frac{1}{4}$–$1\frac{1}{2}$ lin. longum, 2 lin. latum, subæqualiter tricuspidato-trilobum, basi callis 2 oblongis erectis instructum; lobi laterales rotundato-oblongi, obtusi; intermedius apice callo magno obtuso instructus. *Columna* brevissima, in pedem longum extensa. *Mentum* saccato-oblongum, obtusum, 1 lin. longum.

NORTH-EAST CELEBES. Sapoetan Mountains, at 4200–5000 ft., Minahassa, *Koorders*, 29564.

226. **Eria (Hymeneria) celebica**, *Rolfe;* affinis *E. floribundæ*, Lindl., sed racemis et floribus minus pubescentibus et labelli lobis lateralibus angustis dissimilis.

Pseudobulbi subteretes, apice foliati, $4\frac{1}{2}$ poll. longi. *Folia* lanceolata vel oblongo-lanceolata, acuta, 4–7 poll. longa, $\frac{3}{4}$–$1\frac{1}{2}$ poll.

lata. *Racemi* graciles, 5 poll. longi, multiflori, ut pedicelli et flores minutissime puberuli ; bracteæ ovato-oblongæ, acutæ, 1 lin. longæ ; pedicelli graciles, 2 lin. longi. *Sepalum* posticum elliptico-oblongum, subacutum, concavum, $1\frac{1}{2}$-$1\frac{3}{4}$ lin. longum ; lateralia latissime triangularia, obtusa, obliqua, basi cum columnæ pede in mentum oblongum extensum. *Petala* oblonga, obtusa, $1\frac{1}{2}$ lin. longa. *Labellum* $2\frac{1}{4}$–$2\frac{1}{2}$ lin. longum, trilobum ; lobi laterales lineares, subacuti, erecti, $\frac{1}{2}$ lin. longi ; intermedius reflexus, ovatus, obtusus vel emarginatus, convexus, $\frac{3}{4}$ lin. longus ; discus lævis. Columna lata, $\frac{1}{2}$ lin. longa. *Mentum* $1\frac{3}{4}$ lin. longum.

NORTH-EAST CELEBES. Lokon, Goenoeng Klabat, Minahassa, *Koorders*, 29563.

227. **Phreatia Koordersii,** *Rolfe ; P. eleganti*, Lindl., similis, differt bracteis brevioribus et floribus minoribus.

Caules abbreviati, circa 6-phylli. *Folia* elongato-linearia, obtusa, $4\frac{1}{2}$–6 poll. longa, 2–3 lin. lata. *Scapus* gracilis, 9 poll. longus, vaginis lanceolatis paucis obtectus ; racemus 4 poll. longus, multiflorus ; bracteæ oblongo-lanceolatæ, acutæ, concavæ, $\frac{3}{4}$ lin. longæ ; pedicelli $\frac{1}{2}$ lin. longi. *Sepala* ovata, obtusa, $\frac{1}{2}$ lin. longa. *Petala* elliptico-ovata, obtusa, sepalis fere duplo minora. *Labellum* sepalis vix longius, basi late unguiculatum, apice flabellato-dilatatum, $\frac{1}{3}$ lin. latum, discus trinervis. *Columna* brevissima.

NORTH-EAST CELEBES. Summit of Mt. Lolomboelan, Minahassa, *Koorders*, 29493.

228. **Phreatia celebica,** *Rolfe ;* species ex affinitate *P. prorepentis*, Reichb. f., a qua differt petalis lanceolato-ovatis, labello flabellato-dilatato.

Rhizoma repens. *Pseudobulbi* ovati, parvi, 3–4 lin. longi, monophylli. *Folia* lineari-lanceolata, obtusa, $2\frac{1}{4}$–3 poll. longa, 3–$3\frac{1}{2}$ lin. lata. *Scapus* gracilis, $4\frac{1}{2}$ poll. longus ; racemus 2 poll. longus, multiflorus ; bracteæ lanceolatæ, acuminatæ, 1–$1\frac{1}{4}$ lin. longæ ; pedicelli 1 lin. longi. *Sepala* lateralia ovata, acuta vel apiculata, $\frac{1}{2}$ lin. longa ; posticum paullo minus. *Petala* lanceolato-ovata, subacuta, sepalo postico subæqualia. *Labellum* $\frac{1}{2}$ lin. longum, basi unguiculatum, apice flabellato-dilatatum, apiculatum, $\frac{1}{2}$ lin. latum ; discus trinervis. *Columna* brevissima.

NORTH-EAST CELEBES. Sapoetan mountains, at 3600 ft., Minahassa, *Koorders*, 29494.

229. **Calanthe celebica,** *Rolfe ;* ad *C. purpuream*, Lindl., accedit, recedit floribus minoribus, labelli lobis lateralibus multo brevioribus, intermedio latiore, et calcare multo breviore.

Folia petiolata, elliptico-oblonga, acuta, puberula, 4–6 poll. longa vel ultra ; petiolus $1\frac{1}{2}$–4 poll. longus. *Scapus* erectus, pubescens, 6 poll. longus vel ultra, pauciflorus ; bracteæ anguste lanceolatæ, acuminatæ, 4–6 lin. longæ ; pedicelli 6–9 lin. longi. *Sepala* ovato-lanceolata, acuta, 6–7 lin. longa. *Petala* elliptico-oblonga, acuta vel apiculata, 5–6 lin. longa. *Labellum* 6–7 lin.

longum, basi columnæ adnatum, trilobum ; lobi laterales auriculati, $\frac{3}{4}$ lin. longi ; intermedius obovato-flabellatus, emarginatus, crenulatus, 4–5 lin. latus ; discus basi trilamellatus, verrucosus ; calcar lineari-clavatum, 6 lin. longum. *Columna* latissima, $1\frac{1}{2}$ lin. longa.

NORTH-EAST CELEBES. Summit of Mt. Masarang, Minahassa, *Koorders*, 29520.

From an old petiole attached to the specimen, it is evident that the leaves and scape may exceed the dimensions given above.

230. **Trichoglottis oblongifolia,** *Rolfe ;* inter species affines foliis oblongis et forma labelli insignis.

Caulis validus, scandens, vaginis striatis verrucosis obtectus. *Folia* oblonga, subæqualiter et brevissime biloba, $2\frac{1}{2}$–$3\frac{1}{2}$ poll. longa, $\frac{3}{4}$–1 poll. lata, lobis obtusis. *Flores* fasciculati ; bracteæ brevissimæ ; pedicelli 6 lin. longi. *Sepala* patentia, obovato-oblonga, obtusa vel apiculata, 6 lin. longa, lateralia pedi columnæ adnata. *Petala* subspathulata, obtusa, 4 lin. longa. *Labellum* 3-lobum, 7 lin. longum, basi concavum, appendiculo lineari villoso $1\frac{1}{2}$ lin. longo instructum ; lobi laterales semiobovati, suberecti ; intermedius basi orbicularis, 3 lin. latus, apice lineari-oblongus. *Columna* lata, brevissima, apice biauriculata ; basi in pedem latum producta ; auriculæ lineari-oblongæ obtusæ, recurvæ, villosæ, $1\frac{3}{4}$ lin. longæ. *Capsula* oblonga, $2\frac{1}{2}$ poll. longa.

NORTH-EAST CELEBES. Near Kajoewatoe, Minahassa, *Koorders*, 29506.

231. **Trichoglottis celebica,** *Rolfe ;* ad præcedentem accedit, sed foliis latioribus et obtusis, floribus majoribus differt.

Caulis elongatus, polyphyllus. *Folia* anguste oblonga, subobtusa, coriacea, 2–$2\frac{3}{4}$ poll. longa, 5–7 lin. lata ; vaginæ striatæ, rugulosæ, 8–10 lin. longæ, apice auriculatæ. *Flores* fasciculati, pauci ; bracteæ desunt ; pedicelli 2 lin. longi. *Sepala* patentia ; posticum oblongum, subobtusum, 3–$3\frac{1}{2}$ lin. longum ; lateralia obovato-oblonga, obtusa, $2\frac{1}{2}$–3 lin. longa. *Petala* oblonga, subobtusa, 3–$3\frac{1}{2}$ lin. longa. *Labellum* $2\frac{1}{2}$ lin. longum, basi saccatum ; lamina glabra, basi angustata, utrinque auriculata, apice triloba ; lobi oblongi vel subdolabriformes, obtusi, laterales subdivaricati, intermedius carnosulus ; calcar saccato-oblongum, obtusum, divaricatum, $1\frac{1}{4}$ lin. longum, postico lamina oblonga obtusa fere $\frac{1}{2}$ lin. longa instructum. *Columna* crassa, 1 lin. longa, angulis alatis.

NORTH-EAST CELEBES. Ranoeketan, Minahassa, *Koorders*, 29505.

232. **Trichoglottis Koordersii,** *Rolfe* ; ex affinitate *T. lanceolariæ*, Blume, sed partibus omnibus duplo majoribus.

Caulis elongatus, polyphyllus. *Folia* oblongo-lanceolata, subacuta, coriacea, 3–4 poll. longa, 4–5 lin. lata ; vaginæ striatæ, 8–9 lin. longæ. *Flores* fasciculati, numerosi ; bracteæ triangulari-ovatæ, subacutæ, minutæ ; pedicelli $1\frac{1}{2}$–2 lin. longi. *Sepalum*

posticum lineari-oblongum, subacutum, 2 lin. longum ; lateralia oblonga, subacuta, bicarinata, $1\frac{3}{4}$ lin. longa, basi pedi columnæ adnata. *Petala* lineari-oblonga, subacuta, 2 lin. longa. *Labellum* $1\frac{3}{4}$ lin. longum, basi saccatum ; lamina glabra, triloba ; lobus intermedius late oblongus, subobtusus ; laterales triangulares, subobtusi, parvi ; discus medio callo carnoso erecto bilobo instructus ; calcar saccato-oblongum, $\frac{1}{2}$ lin. longum, postico callo parvo instructum. *Columna* brevissima.

NORTH-EAST CELEBES. Lolomboelan, and near Totok and Ratatotok, Minahassa, *Koorders*, 29504, 29507.

233. **Vanda celebica,** *Rolfe ;* ad *V. concolorem*, Blume, accedit, recedit labelli lobo intermedio carnoso lateraliter compresso.

Caules breves, polyphylli. *Folia* ligulata, apice inæqualiter biloba, 12–13 poll. longa, 10–12 lin. lata, lobis subobtusis. *Scapus* circa 5 poll. longus, pauciflorus ; bracteæ ovato-oblongæ, obtusæ, concavæ, $1\frac{1}{2}$ lin. longæ ; pedicelli $2\frac{1}{4}$ poll. longi. *Sepala* 10–12 lin. longa, unguiculata ; lamina ovata, obtusa, undulata, 5–7 lin. lata. *Petala* sepalis similia, paullo minora. *Labellum* 5–6 lin. longum, trilobum ; lobi laterales semiovati, obtusi, $2\frac{1}{2}$–3 lin. longi ; intermedius 3–$3\frac{1}{2}$ lin. longus, lateribus omnino compresso-reflexis, basi utrinque dente oblongo reflexo instructus, apice truncatus et lobis 2 oblongis obtusis carnosis erectis instructus ; discus tricarinatus ; calcar conicum, obtusum, compressum, $3\frac{1}{2}$–4 lin. longum. *Columna* 3 lin. longa.

NORTH-EAST CELEBES. Minahassa, without precise locality, *Koorders*, 29502.

234. **Cleisostoma Koordersii,** *Rolfe ; C. latifolio*, Lindl., simile, sed floribus paullo majoribus, labelli lobis lateralibus multo latioribus distinctum.

Caulis abbreviatus. *Folia* approximata, lineari-oblonga, emarginata vel brevissime inæqualiter biloba, 5–6 poll. longa, 11–15 lin. lata, crasso-coriacea. *Inflorescentiæ* pedunculus circa $1\frac{1}{4}$ ped. altus, apice parce ramosus ; rami 1–2 poll. longi, multiflori ; bracteæ late triangulari-ovatæ, subacutæ, divaricatæ, rigidæ, $\frac{1}{2}$ lin. longæ ; pedicelli 4–5 lin. longi. *Sepala* et *petala* obovato-oblonga, obtusa, $2\frac{1}{2}$–3 lin. longa, subpatentia. *Labellum* trilobum ; lobi laterales latissime triangulari-ovati, subobtusi, $\frac{1}{2}$ lin. longi ; intermedius latissime ovatus, subobtusus, recurvus, carnosus, $\frac{1}{2}$ lin. longus ; calcar saccato-oblongum, obtusum, $1\frac{1}{2}$–2 lin. longum ; callus late oblongus, submembranaceus, apice bilobus, $\frac{3}{4}$ lin. longus. *Columna* latissima.

NORTH-EAST CELEBES. Near Ratatotok, and Amoerang, Minahassa, *Koorders*, 29500, 29501.

235. **Tæniophyllum celebicum,** *Rolfe ;* ad *T. obtusum*, Blume, accedit, differt bracteis approximatis nec imbricatis, labello ecalcarato subacuto edentato.

Caulis brevissimus. *Scapi* gracillimi, glabri, 1–$1\frac{3}{4}$ poll. longi ; racemi 3–4 lin. longi ; bracteæ distichæ, approximatæ, squarrosæ,

late ovato-oblongæ, obtusæ, conduplicatæ, subscabridæ, $\frac{1}{2}$ lin. longæ; pedicelli graciles, 2–$2\frac{1}{4}$ lin. longi. *Sepala* et *petala* lineari-lanceolata, subacuta, $1\frac{1}{2}$ lin. longa. *Labellum* ovatum, apice acuminatum et subacutum, $1\frac{1}{2}$ lin. longum, ecallosum, basi concavum, nec saccatum. *Columna* brevissima.

North-east Celebes. Near Kajoewatoe, Minahassa, *Koorders*, 29499.

This species is somewhat anomalous in the genus by reason of the absence of a spur.

236. **Appendicula longipedunculata**, *Rolfe*; *A. cristatæ*, Blume, proxima, sed foliis elliptico-oblongis, labello ecristato diversa.

Caules subcompressi, elongati. *Folia* elliptico-oblonga, obtusa, $1\frac{1}{2}$–$1\frac{3}{4}$ poll. longa, 6–8 lin. lata. *Pedunculi* elongati, $\frac{3}{4}$–1 ped. longi, vaginis lanceolatis acutis numerosis obtecti, prope apicem nonnunquam ramosi; racemi multiflori; bracteæ oblongo-lanceolatæ, acuminatæ, 1–$1\frac{1}{2}$ lin. longæ; pedicelli 2 lin. longi. *Sepalum* posticum late ovatum, acutum, concavum, 1 lin. longum; lateralia triangulari-ovata, acuta, fere 2 lin. longa. *Petala* late ovata, subacuta, 1 lin. longa. *Labellum* late oblongum, subtrilobum, $1\frac{1}{2}$ lin. longum; lobi laterales brevissimi, rotundati; intermedius quadratus, obscure tridendatus, concavus. *Columna* brevissima. *Mentum* oblongum, obtusum, 1–$1\frac{1}{4}$ lin. longum. *Capsula* oblonga, 5–6 lin. longa.

North-east Celebes. Near Pakoe-oere, Minahassa, *Koorders*, 29495.

237. **Macodes celebica**, *Rolfe; M. javanicæ*, Hook, f., proxima, differt foliis minoribus, labelli lobis lateralibus oblongis multo minoribus, intermedio majore.

Caulis brevis. *Folia* petiolata, ovato-oblonga, apiculata, $1\frac{1}{2}$–2 poll. longa, 10–13 lin. lata; petiolus 5–6 lin. longus, basi in vaginam latam amplexicaulem expansus. *Scapus* deest; pedicelli 4 lin. longi. *Sepala* ovato-oblonga, subobtusa, 3 lin. longa. *Petala* linearia, subobtusa, 3 lin. longa. *Labellum* ample saccatum, trilobum, 3 lin. longum; lobi laterales oblongi, obtusi, $\frac{3}{4}$ lin. longi; intermedius unguiculatus, orbiculatus, $1\frac{1}{4}$ lin. longus. *Columna* $1\frac{1}{2}$ lin. longa.

North-east Celebes. Near Kajoewatoe, Minahassa, *Koorders*, 29492.

The Kew specimen is imperfect, one scape only being found in flower, and this is preserved at Buitenzorg.

238. **Peristylus bilobus**, *Rolfe;* ad *P. Brandisii*, Kränzl., accedit, sed foliis duplo brevioribus, labelli calcare clavato-oblongo apice bilobo recedit.

Planta $1\frac{1}{4}$ ped. alta. *Caulis* infra medium foliatus. *Folia* oblongo-lanceolata, acuta vel acuminata, $\frac{1}{2}$–2 poll. longa, 3–7 lin. lata. *Spica* elongata, angusta, circa 7 lin. longa; bracteæ lanceolatæ, acuminatæ, 2–4 lin. longæ; pedicelli 2–3 lin. longi. *Sepala*

et *petala* erecta, ovato-oblonga, obtusa, $1\frac{1}{4}$ lin. longa. *Labellum* trilobum, basi latum ; lobi laterales divaricati, filiformes, $2-2\frac{1}{2}$ lin. longi ; intermedius triangularis, subacutus, 1 lin. longus ; calcar clavato-oblongum, $1\frac{1}{4}$ lin. longum, apice bilobum. *Columna* brevissima.

NORTH-EAST CELEBES. Sapoetan Mountains, Minahassa, *Koorders*, 29489.

239. **Vanilla Hartii**, *Rolfe ;* species distinctissima, ex affinitate *V. Sprucei*, Rolfe, differt foliis brevioribus et floribus minoribus.

Caules subgraciles ; internodia $3\frac{1}{2}-4\frac{1}{2}$ poll. longa. *Folia* breviter petiolata, ovato-oblonga, acuminata, $2-2\frac{1}{2}$ poll. longa, circa $\frac{3}{4}$ poll. lata, crassiuscula ; petioli 3 lin. longi. *Racemi* breves, crassiusculi, pauciflori, 5–8 lin. longi ; bracteæ late ovatæ, acutæ, $1\frac{1}{2}-2$ lin. longæ ; pedicelli $\frac{3}{4}$ poll. longi. *Sepala* oblongo-lanceolata, subobtusa, $1\frac{1}{2}$ poll. longa. *Petala* sepalis paullo angustiora, cætera similia. *Labellum* columnæ fere omnino adnatum, $1\frac{1}{4}$ poll. longum ; tubus medio angustissimus, basi subinflatus ; limbus cuneato-dilatatus, subinteger, obtusus, crenulatus ; disci venæ paullo incrassatæ, præsertim prope apicem, ibi tuberculis retrorsis paucis instructæ ; crista appendicibus foliaceis denticulatis retrorsis composita. *Columna* gracilis, $1\frac{1}{4}$ poll. longa.

TRINIDAD. Cabasterre Arima, *Hart*, 6355.

240. **Vanilla fimbriata**, *Rolfe ;* species ex affinitate *V. ensifoliæ*, Rolfe, sed foliis brevioribus et floribus minoribus.

Caules crassiusculi ; internodia $3-5\frac{1}{2}$ poll. longa. *Folia* breviter petiolata, lanceolata vel lineari-oblonga, acuta vel subacuminata, $2\frac{1}{2}-5\frac{1}{2}$ poll. longa, 7–11 poll. lata, crassiuscula ; petioli 2–3 lin. longi. *Racemi* crassiusculi, $1-1\frac{1}{4}$ poll. longi, multiflori ; bracteæ ovato-oblongæ, obtusæ, 3–4 lin. longæ ; pedicelli $\frac{3}{4}-1\frac{1}{4}$ poll. longi. *Sepala* et *petala* lineari-lanceolata, subobtusa, 13–15 lin. longa. *Labellum* 12–14 lin. longum, columnæ margine longe adnatum ; tubus angustus ; limbus 5 lin. latus, obtusus, fimbriatus ; disci venæ leviter incrassatæ ; crista carnosa, paullo fimbriata, retrorsa. *Columna* gracilis, 10-11 lin. longa.

BRITISH GUIANA. Barima River, *Jenman*, 6771.

A very distinct species. The flowers are noted as green outside, whitish green inside, and the lip whitish tinged with yellow in the throat.

MISCELLANEOUS NOTES.

MR. WILLIAM NORMAN SANDS, a member of the gardening staff of the Royal Botanic Gardens, has been appointed on the recommendation of Kew, by the Secretary of State for the Colonies, Curator of the Botanic Station in Antigua.

MR. MURDO MCNEILL, a member of the gardening staff of the Royal Botanic Gardens, has been appointed on the recommendation of Kew, by the Secretary of State for the Colonies, Agricultural Instructor in St. Vincent.

MR. ALBERT JOHN JORDAN, a member of the gardening staff of the Royal Botanic Gardens, has been appointed on the recommendation of Kew, by the Secretary of State for the Colonies, Agricultural Instructor in Montserrat.

Botanical Magazine for June.—*Begonia venosa* is a distinct new species discovered by Professor Lofgren, head of the Botanical Department of the State of Sao Paolo, in an island off the coast of North Brazil. Seeds were sent to Mr. Thomas Christy, F.L.S., from whom Kew subsequently received the specimen figured, and a plant which is now growing in the Begonia house. The species, which in several respects resembles *B. incana*, is well characterised by its large transparent stipules. *Moræa sulphurea* is a new species from Cape Colony, whence corms were sent to Kew by Mr. J. Matthews, of Cape Town. In habit it resembles *M. Baurii* and *M. lurida*, having slender stems terminated by a single cluster of flowers. *Kleinia pendula*, native of Arabia, Abyssinia and Somaliland, is a singular plant with cylindric, fleshy branches and stout peduncles, each bearing a single head of bright vermilion coloured flowers. The specimen drawn was sent by Mr. R. T. Lynch, A.L.S., Curator of the Cambridge Botanic Garden. In the collection of living plants at Kew are good specimens, which were received from Mrs. Lort Phillips and the late Mr. J. Theodore Bent. *Chrysanthemum nipponicum* is a compact, vigorous-growing undershrub, with flower-heads much like those of *C. Leucanthemum*. The Kew plant was procured from Messrs. Damman and Co., of Naples. *Iris Delavayi*, from Yunnan, is closely allied to *I. sibirica*. It was obtained at Kew from seeds communicated by M. Micheli, of the Château du Crest, near Geneva, who described the species.

Botanical Magazine for July.—The drawing of the handsome *Yucca Whipplei*, a native of the Rocky Mountains of California, was made from a specimen grown in the gardens of Thomas Hanbury, Esq., at La Mortola. This specimen was raised from seed, and flowered for the first time when nine years old. *Acacia sphærocephala*, from Central America, is an interesting myrmecophilous plant. It is remarkable for its extrafloral nectaries, and for bearing, on the tips of the leaflets, small yellow bodies which are consumed by the ants, the latter inhabiting the large, horn-like stipules. *Masdevallia muscosa*, though a somewhat insignificant plant, is noteworthy on account of its being the only known species possessing a sensitive lip. This springs upwards when touched by an insect, which is entrapped for a time between the lip and the column. The flowers are yellow streaked with

purple. *Crassula pyramidalis* is an exceedingly curious species from the Cape. The Kew plant has a quadrangular stem about 3 inches high, and quite hidden by the leaves, and small, white flowers. *Rosa xanthina* is a native of Central Asia and Afghanistan. In Afghanistan it was discovered by the late Dr. Aitchison, growing in abundance in the Kuram Valley; but, curiously, it has been recorded from no other locality.

Hooker's Icones Plantarum.—The seventh volume of the fourth series (part I., June, 1899), begins with a number of interesting grasses from South Africa and the highlands of British New Guinea. *Guilianettia* (plate 2616), is a new genus of Orchideæ from the latter country, related to *Ceratostylis.* Another interesting orchid is *Catasetum labiatum*, both sexes of which are represented in the same plant. *Moquilea Platypus*, Hemsl., and *Couepia dodecandra*, Hemsl. (plates 2618 to 2621), produce edible fruits, and are native, or cultivated, in the West Indies and Central America. They both belong to the Chrysobalaneæ. This part of the *Icones* also contains a number of novelties from Western China, including *Passiflora Henryi*, *Shortia sinensis*, and *Lespedeza diversifolia*, three noteworthy plants.

Lonicera hildebrandiana.—The first flowering in Europe of this fine species at the Royal Botanic Gardens, Glasnevin, was recorded in the *Kew Bulletin* for last year (p. 317). It has since flowered early in June last in the South Wing of the Temperate House at Kew, and more recently in the Royal Botanic Gardens, Edinburgh.

A gigantic annual.—The growth of many herbaceous plants from seed in a single season is often, as in the *Cucurbitaceæ*, enormous. But in development of stem and branches there is probably no parallel to the case described in the following letter. *Acnida australis* belongs to a small genus of Amarantaceæ confined to North America and Trinidad.

MR. C. H. BAKER TO ROYAL GARDENS, KEW.

Grasmere, P.O., Orange Co.,
Florida, U.S.A., November 2, 1897.

DEAR SIR,

THE writer begs leave to address you respecting a matter that he trusts will not prove uninteresting.

He resides in the peninsular portion of the State of Florida, some 20 miles south of the 29th parallel of north latitude, and in the immediate neighbourhood of Lake Opopka, which is third in area of Florida's lakes, and which variously affects a considerable extent of country.

Amongst the plants of the district above specified is *Acnida australis*, Gray, which is, of course, known botanically, appearing briefly characterized in the "Flora of the Southern States," by

Dr. A. W. Chapman, second edition. It is, however, not yet really familiar, has attracted no special attention, and apparently no notice has been taken of the size and development it here attains.

On the 30th October the writer visited a station where it is both abundant and accessible, and measured three individuals, of which he here offers the dimensions, viz. :—

1. Staminate. Circumference at collar 3 ft. 1½ in.—Total height 22 ft. 0 in.
2. Pistillate. Circumference at collar 1 ft. 8 in.—Total height 17 ft. 3 in.
3. Pistillate. Circumference at collar 2 ft. 1½ in.—Total height 22 ft. 6 in.

The above specimens were selected on account of their size, but they are not of maximum height, as the writer observed at least one plant in their neighbourhood which considerably exceeded them but which it was not practicable to measure on account of treacherous footing. He is, moreover, well satisfied that greater size is attained, since he has seen the base of a plant, cut off by another person, which was 15 in. in diameter at about 1 ft. above the collar, and certainly 18 to 20 in. in diameter at the collar itself. Besides, he has himself measured a dry and broken stem of a previous season's growth that was 21 ft. 10 in. in height. He is, therefore, quite satisfied that this plant reaches the height of 25 ft. in this neighbourhood, while, since it is found further south, it may grow still taller. "Thirty feet high and as big as a barrel" is a phrase he has heard used in characterizing it, from which some discount must probably be allowed. The average of the multitude of plants in sight must be between 12 and 15 ft. and the extent of their branches from 4 ft. in the case of slender specimens, to 10 ft. or more for the larger ones.

The site occupied by the Acnidas is a considerable depression amongst sandy and timbered hills, sinuous in plan and communicating with, really forming a part of, the basin of Lake Apopka, the water-level of which within a few years was continuous on it. The water has now receded owing to lack of rainfall and to the partial reclamation of the marsh-lands adjacent to the lake leaving the depression in a boggy condition, filled as it is with the débris of the former aquatic growth, which consisted of *Pontederia*, *Sagittaria*, *Nuphar*, *Cladium*, &c., augmented considerably by that of *Acnida* itself, forming a muck, or vegetable mud, of a spongy consistence from 3 ft. in depth downward.

In this soil the *Acnida* seems to meet with its most favourable conditions, its central or tap root tapering abruptly and usually bending into a right angle about a foot below the surface, while its lateral roots radiate from the collar and make their way downwards at a slight angle to a distance of 3 ft. or more, their function being to some extent that of affording anchorage. The base of the trunk is dilated to four or five times its average thickness into which it tapers some 2 or 3 ft. above the base. The trunk itself is columnar, and hollow from the base upwards to the apical growth, strongly thickened within and without into distinct nodes from which the branches grow.

In the measured dry stem, or trunk, already mentioned, a woodpecker had chiselled a hole $1\frac{1}{2}$ in. in diameter at a height of 8 ft. 9 in. from the ground in order to make its nest.

The trunks are usually quite straight but stand considerably out of the vertical. The pistillate plants appear to be the more robust, their lower limbs or branches sustain the weight of a heavy man climbing up into them. Their bases, and the bases of their limbs, are dark crimson in colour; the leaves in spring and summer are abundant, shining, and of a rich green, so that although the plant is rather coarse it has much the same effect, in the case of a well-grown individual, as a clump of the smaller bamboos.

The *Acnida* makes most of its growth from May to August, ripening its fruit variously in September and October. The writer has pleasure in forwarding with this communication some fruiting shoots of the largest specimen, exhibiting its utricles and seeds, of which, in consideration of such interest as they may possess, he begs your acceptance for Kew.

Early last spring he sowed seeds of various Amaranths with coloured foliage amongst young plants of *Acnida*, hoping thus to foster the natural production of hybrids with similar foliage: the experiment however seems not to have succeeded thus far.

The species herein mentioned is noted as *Acnida australis*, such is the reference last made by Dr. Chapman and as such it probably appears in the new edition of his Flora. There are most likely two species attaining unusual size, the other having interrupted flower-spikes, while in the case of that particularly noted they are very close or cylindrical.

The writer is interested in inquiring as to some of the annuals from other countries that approach, or exceed, this in size, and should be greatly obliged for whatever information may be, at any suitable or convenient opportunity, imparted on the subject. He is, of course, familiar with our taller American annuals and with those of similar character already introduced into cultivation elsewhere; and asking your indulgence for the length of this, remains,

Your obedient servant,

(Signed) CHARLES HENRY BAKER.

W. T. Thiselton-Dyer, Esq.,
Royal Gardens, Kew.

In order to test these statements some of the seed was sown in heat at Kew, in February, 1898. The plants raised were put out in ordinary garden soil in the open air in June. In October the largest plant had attained the following dimensions:—Height, 10 ft.; diameter of stem at base, 7 in.; branches near base, 5 ft. long, $1\frac{1}{2}$ in. diameter; leaves, including petiole, 14 in. long, 3 in. wide. A slight frost then killed all the leaves and the ends of the branches.

Uganda Clover.—Mr. Alexander Whyte, F.L.S., Curator of the Botanic Station, Uganda, has sent to Kew a supply of seed of a clover which Mr. Scott Elliot found common at Kikuya, at 5–6,000 ft. It was originally discovered by Sir Harry Johnston

on Kilima N'jaro, at 10,000 ft., in 1885, and was described by Prof. Oliver (*Trans. Linn. Soc. Bot.*, 2nd ser., vol. ii., p. 331) as *Trifolium Johnstoni*. It is a near ally of the widely dispersed *Trifolium repens*, which it closely resembles. Mr. Whyte wrote:—"The rich trefoil of clover growing in the marvellously fattening pastures of Kikuya. A splendid plant to introduce into hill pastures of other tropical countries." Seeds have been distributed for trial in the Colonies and elsewhere.

Penguins.—Mr. Albert Linney, the Head Gardener at Government House in the Falkland Islands, who was formerly in the employ of Kew, has, on recently returning home on leave, brought with him three Penguins for the collection of aquatic birds in the Royal Botanic Gardens. Two were specimens of *Aptenodytes papua* and the third, the smaller (since dead), is *Spheniscus magellanicus*.

Use of Orchid-bark for Ornament.—In some "Notes on Orchids in the Jungle" (*Orchid Review*, 1893, vol. I., p. 82), the late Major-General E. S. Berkeley described the use of the "fibre" of *Dendrobium secundum* for making the string or "connector" with which the aborigines of N. Andaman attach the head to the shaft of their arrows. The employment of orchids for any useful purpose is rare, and the present seemed so exceptional that application was made to Mr. E. H. Man, C.S.I., Deputy Superintendent of the Andamans, for specimens illustrating it for the Kew Museum.

Mr. Man very kindly forwarded to Kew an interesting letter (dated December 6, 1893), from Mr. M. V. Portman, Officer-in-Charge of the Andamanese, which corrected General Berkeley's account in many particulars:—

"The connector attaching the head to the shaft of the 'Éla,' the arrow used for shooting pig, is made of the fibre of *Anodendron paniculatum* ('Yólba'), and orchid bark is never used in its manufacture.

"Orchid bark (Rá) is, however, worked into the Yólba fibre binding the heads of the fish arrow (Táulbod), and also in the head of the Éla, but as an ornament only, owing to its bright yellow colour. It is prepared as follows:—The orchid is roasted over embers, until the bark becomes of a straw colour, and the bark is then stripped off by a shell-knife. It is very brittle, owing to the baking it has received, has no toughness at any time, and is absolutely valueless commercially."

Mr. Man has been good enough to send to Kew an interesting series of objects consisting of bracelets, armlets, a waist-belt, and head ornament, made of shells fastened to a coarse cord which is covered with the bright yellow skin or bark exactly corresponding with that which covers the pseudobulbs of *Dendrobium secundum*.

In a farther letter, dated June 18, 1894, Mr. M. V. Portman says:—"The Öngés of the Little Andaman Island make more use of the bark than the aborigines of the Great Andaman, their

ornaments being composed of it . . . The people of the western tribe of Torres Straits, who in their customs greatly resemble the Andamanese, make a similar use of orchid bark; specimens are probably in the British Museum. (See a paper by Professor A. C. Haddon in the *Journal of the Anthropological Institute*, November 26, 1889, pp. 385, 386)."

New Products from the Upper Congo.—Through the kindness of M. Emile Laurent, Professor of Botany at the State Institute of Agriculture, Gembloux, Belgium, the Kew Museum has received an interesting series of samples of caoutchouc obtained from species of *Landolphia* growing in the Belgian possessions on the Upper Congo. Several of the forms in which they are prepared are such as are not seen in English commerce, and one sample, prepared in block form, is of remarkably fine quality, being singularly free from impurities, and equalling in appearance fine Para rubber.

In a note accompanying the samples Professor Laurent says that the juice of *Costus lucanasianus* is used to coagulate the rubber. Accompanying these specimens is also a section of a stem of a new copal yielding tree with the resin *in situ*, together with some separate lumps. In appearance this resin comes nearest to that of Inhambane copal from *Copaifera gorskiana*, Benth., samples of which were received and reported upon by Messrs. R. Ingham, Clark & Co., in 1888 (*Kew Bulletin*, 1888, pp. 281–83). It also has some resemblance to Ogea gum, the produce of a tree of the Gold Coast, and supposed to be a species of *Daniellia*.

The plant yielding this newly discovered copal from the Congo has been named *Trachylobium dewevrianum*.

A sample of this new copal has been submitted to Messrs. R. Ingham, Clark & Co., who report upon it, under date August 10th, 1897, as follows:—

"We have had the sample of gum tested at the works. In appearance it resembles Accra, but we think it a very recent gum. It has a melting point of about 300°–320°, ignites very freely under heat, and is extremely 'stringy' when melting, which is not a good point, and in this respect it resembles soft Manila.

"We attribute it, however, to the sample being, as we say, of recent exudation, and probably much older and harder qualities can be found below the surface of the ground.

"The commercial value would be about £40 per ton. It is, however, impossible to judge the value of a 'find' of this kind without having a considerable bulk sample."

Hibiscus lunariifolius.—In a despatch to the Secretary of State, dated Feb. 25, 1899, Mr. Low, the Acting Governor of the Gold Coast, stated that the Curator of the Botanic Station was "preparing some specimens of a fibre which he has procured from a long twig-like tree by soaking the twigs in water and then removing the outer covering." He added:—"He will prepare and take

to England samples of this fibre. The tree grows about two days journey from Aburi." The plant yielding the fibre has been identified as *Hibiscus lunariifolius*. Kew is indebted to Messrs. Ide and Christie for the following report upon the commercial value of the fibre :—

MESSRS. IDE AND CHRISTIE TO ROYAL GARDENS, KEW.

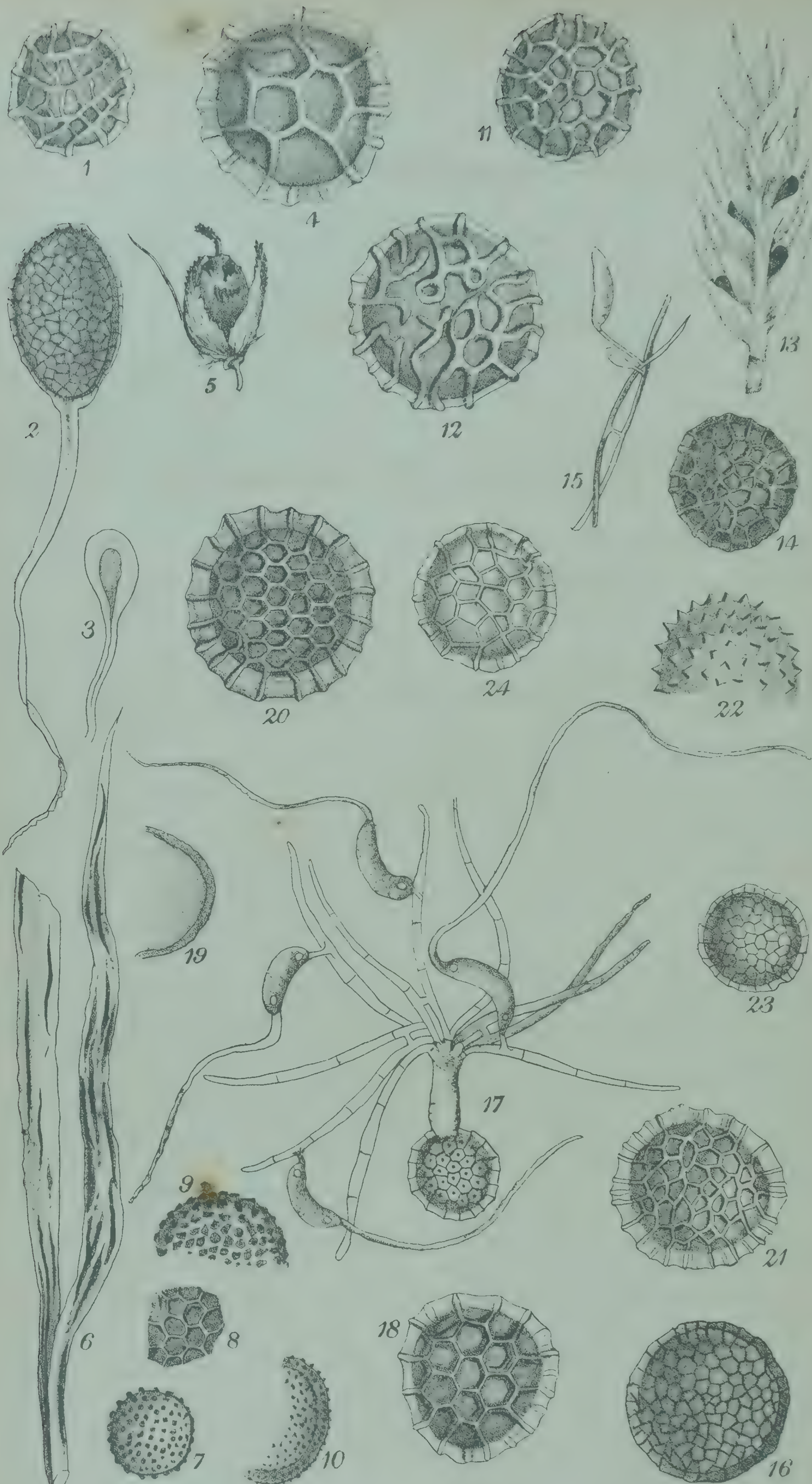
72, Mark Lane, London, E.C.

DEAR SIR,

Your favour of the 16th and samples to hand.

Hibiscus lunariifolius.—This is a Jute, good colour, and hard, similar to that received from China; will sell freely at £12 to £13 per ton.

Yours faithfully,
(Signed) IDE & CHRISTIE.



SPORES OF TILLETIA.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 153-154.] SEPTEMBER and OCTOBER. [1899.

DCLVI.—A REVISION OF THE GENUS TILLETIA.

(*With Plate.*)

GEO. MASSEE.

All species included in the genus, as at present defined, are endophytic obligate parasites, and out of a total of twenty-six species, all are parasitic on plants belonging to the Gramineæ, with the exception of *Tilletia arctica*, Rostr., and *T. Sphagni*, Nawaschin. The former of these is parasitic on *Carex festiva*, Dewey, and the latter in the capsules of *Sphagnum squarrosum*, Pers. The infested capsules are somewhat dwarfed, and formed what were known as microsporangia by bryologists, while the fungus spores they contained were called microspores.

In the Uredineæ what may be termed biological species have been proved to exist; that is to say, of a species one or more forms not morphologically distinct may exist, that are distinguishable only by the fact that they are confined to one particular host-plant.

Professor Eriksson, our best authority on grain-rusts, has the following remarks* on this phase of the subject:—"Between certain of these forms which constitute a species, for instance, the three forms of black rust—*Puccinia graminis*, Pers.—we have not succeeded in discovering, even with the aid of a microscope, any distinguishing difference, such as the size, colour, and distribution of the pustules, the shape and size of the spores, &c. However, there is a difference between them with regard to their inner nature that is of no little practical interest. The difference appears in that every form is almost exclusively confined to its particular cereal, and that consequently it is able to infect no cereal but that one."

* Eriksson in Bot. Gaz. xxv. (1898), p. 29.

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In the genus *Tilletia* the existence of such biological forms has not been demonstrated, but the species enumerated in the following pages are founded on morphological characters.

Examination of a large amount of material has led to the conclusion that the host-plant is absolutely worthless as a factor in the discrimination of morphologically defined species. For this reason the species as here understood, do not coincide with those of many previous workers, where the host was an important, and not infrequently the only feature relied upon for distinguishing between presumedly distinct but allied species.

With regard to geographical distribution, the genus is very widely distributed, whereas the species are restricted in their range, each being confined to a portion of one Continent, with the exception of those species that are parasitic on cultivated cereals, the explanation of which is obvious. Of these *Tilletia Caries* occurs in Europe, Africa, Australia, United States, South America; *T. levis* in Europe, Australia, United States; *T. Hordei* in Europe, Asia, Africa.

The following table shows the distribution of the species :—

Europe, 13 species.—*lævis*, *de Baryana*, *arctica*, *Lolii*, *controversa*, *separata*, *Caries*, *Rauwenhoffii*, *Hordei*, *endophylla*, *Sesleriæ*, *Berkeleyi*, *Sphagni*, (*Fischeri*?).
Asia, 2 species.—*controversa*, *Hordei*, (*Vulpiæ*?).
Africa, 3 species.—*verrucosa*, *Caries*, *Hordei*.
Mauritius, 1 species.—*Ayresii*.
Australia, 4 species.—*lævis*, *mixta*, *epiphylla*, *Caries*.
United States, 9 species.—*lævis*, *rotundata*, *mixta*, *rugispora*, *cerebrina*, *buchloeana*, *Caries*, *Elymi*, *fusca*.
Antilles, 1 species.—*magnusiana*.
South America, 3 species.—*hyalospora*, *Caries*, *zonata*.

TILLETIA, Tulasne in Ann. Sci. Nat., sér. 3, vol. vii., p. 112 (1847); Sacc., Syll. vii. (1888), p. 481.

Endophytic obligate parasites. Spore-mass pulverulent, black or blackish-olive at maturity, often fœtid, especially when moistened. Spores free, produced singly at the tips of somewhat gelatinous, swollen, fertile hyphæ, at first covered by the epidermis of the host, forming a blackish powdery mass at maturity. On germination, the spore gives origin to a promycelium, which bears a terminal whorl of slender, elongated secondary-spores at its apex. Secondary-spores usually conjugating in pairs, and on germination producing slender, elongated conidia.—*Ustilago*, Link, in Berl. Mag. der Gesellsch. der Nat. Freunde, iii. (1809); Lév., in Ann. Sci. Nat., sér. 2, xi. (1839), 116.

Tulasne separated the species included under *Tilletia*, from the heterogeneous assemblage of species previously included under *Ustilago*, *Uredo*, *Erysibe*, &c., of old authors, taking as his principal generic character, the peculiar mode of germination and production of secondary-spores as observed in *Tilletia Caries* (*T. Tritici*, Winter).

The principal distinctive features of *Tilletia*, as defined by the systematist are :—spores free (not aggregated in groups), forming

a dry pulverulent mass at maturity, and producing on germination a whorl or cluster of secondary-spores at the apex of the promycelium.

Entyloma agrees in the free spores, and in the mode of production of the secondary-spores, but differs in the spore-mass not being pulverulent at maturity.

Urocystis agrees with *Tilletia* in the spore-mass being dry and pulverulent when mature, also in the method of germination and formation of secondary-spores, but differs in the spores being produced in groups, the central ones of the group being fertile, the peripheral ones sterile.

The mode of spore-germination is up to the present unknown in more than half the accepted species, their claim to a position in the genus depending on the two remaining features indicated above—spores free, forming a pulverulent mass at maturity; now these characters are also common to the genus *Ustilago*, and the means of distinguishing between the two genera in the absence of evidence afforded by germination, and absence of knowledge as to the origin of the spores, turns on the relatively much larger spores in *Tilletia*, which (with one exception, *T. lævis*) have the epispore reticulated or warted.

Neovossia was originally separated from *Tilletia* on some slight difference in the structure of the epispore. It has recently been studied by Brefeld, and although the spore-structure does not indicate a generic distinction, this author retains the genus as valid; the distinction from *Tilletia* advanced being a negative character—the secondary spores are produced in a tuft at the apex of the promycelium, as in *Tilletia*, but do not conjugate in pairs as in the last-named genus. This attitude is somewhat surprising, remembering that Brefeld does not admit of any sexual significance in a junction by a transverse band of adjoining pairs of secondary-spores.

Key to the species.

Series A. Epispore smooth ... ... 1. *T. lævis.*
Series B. Epispore warted or echinulate.
Spores produced in the ovary.
Spores 20–25 μ; epispore with acute pyramidal warts ... 2. *T. verrucosa.*
Spores 20–25 μ; epispore densely covered with minute warts ... ... 3. *T. rotundata.*
Spores deep chestnut-brown under the microscope, 16–18 μ; epispore very minutely warted ... ... 4. *T. mixta.*
Spores straw-coloured under the microscope, 13–16 μ; epispore very minutely warted ... ... 5. *T. Ayresii.*
Spores yellow-brown under the microscope, 12–15 μ; epispore densely and minutely warted ... ... 6. *T. magnusiana*
Spores 16–22 μ, densely covered with minute, irregular, flat-topped, dark coloured warts, formed by the breaking up of the epispore, interstices paler ... ... 7. *T. rugispora.*
Spores produced in leaves and culm.
Spores 10–18 μ, densely covered with minute, dark, flat-topped warts formed by the breaking up of the epispore, interstices paler ... ... 8. *T. de Baryana.*
Spores blackish-brown under the microscope; epispore minutely papillose ... ... 9. *T. arctica.*
Spores 35–38 μ; epispore with scattered exceedingly minute warts ... ... 10. *T. epiphylla.*

Series C. Epispore reticulated.
Spores produced in the ovary.
Spores sub-hyaline or very pale brown under the microscope.
Spores 20-24 μ, almost colourless; epispore with subconcentric ribs united by transverse bars ... ... 11. *T. hyalospora.*
Spores 23-26 μ, pallid; epispore with a shallow, small-meshed network ... ... 12. *T. Lolii.*
Spores 18-25 μ, pale brown; epispore with a shallow, large-meshed network... ... ... 13. *T. controversa.*
Spores dark brown under the microscope.
Ridges on the epispore with numerous free ends, or more or less formed of coalesced warts.
Spores 23-28 μ; epispore with ridges forming a reticulation, but having many free ends... ... 14. *T. cerebrina.*
Spores 16-21 μ; ridges of the epispore forming the reticulation mainly formed of confluent warts or spines ... ... 15. *T. buchloeana.*
Reticulation of the epispore formed of plates or ridges without free ends.
Spore-mass foetid.
Spores 20-27 μ; network of epispore, large-meshed 16. *T. separata.*
Spores 17-22 μ; network of epispore, small-meshed 17. *T. Caries.*
Spore-mass not foetid.
Spores 24-28 μ, dark olive-brown; reticulation of epispore shallow and small-meshed ... ... 18. *T. Elymi.*
Spores dark brown, averaging 33 μ; ridges of epispore 4 μ high; meshes polygonal, large ... 19. *T. inolens.*
Spores 25-30 μ, olive-brown; reticulation of epispore rather deep, large-meshed ... ... 20. *T. Rauwenhoffii.*
Spores 16-25 μ, dark brown; reticulation of epispore large-meshed, mesh very irregular in form ... 21. *T. fusca.*
Spores 19-20 μ, brown; reticulation of epispore small meshed ... ... 22. *T. Hordei.*
Spores 15-18 μ, brown; reticulation of epispore small-meshed ... ... 23. *T. zonata.*
Spores produced on the leaves or culm.
Spores 18-25 μ, brown, border similarly coloured; reticulation of the epispore small meshed... ... ... 24. *T. endophylla.*
Spores 25-28 μ, dark brown; reticulation of epispore shallow and small-meshed ... ... 25. *T. Sesleriæ.*
Spores 15-18 μ; reticulation of epispore very small-meshed 26. *T. Berkeleyi.*
Spores produced in the capsules of Sphagnum ... ... 27. *T. Sphagni.*

1. **Tilletia lævis**, *Kühn in Rabenh. Fung. Eur.* (1873), 1697.—Spore-mass produced in the ovary, deep brown with an olive tinge, foetid; spores globose, angularly globose, elliptic, &c., very variable in form and size, averaging 17-21 μ, or 15-26 × 10-15 μ, wall about 2 μ thick, pale olive-brown or sometimes almost cream-colour, epispore perfectly smooth.—Fischer de Wald., Aperçu (1877), 47; Wint. in Rabenh. Krypt. Flora, Pilze, i. (1884), 109; Sacc., Syll. vii. (1888), no. 1776. *T. fœtens*, Arthur in Bull. Agric. Exper. Stat. Indiana, no. 28 (1889), ex Journ. Myc. v. 165. *Ustilago fœtens*, Berk. & Curt. in Grevillea, iii. (1874), 59.

HOST.—*Triticum vulgare*, Linn.

HAB.—England, France, Germany, Italy, Austria, Hungary, Russia, United States, Victoria.

Exsicc.—Rabenh. Fungi Eur. 1697; Roum. Fung. Sel. Exs., 5217; Sacc. Myc. Ven., 373; Ellis, N. Amer. Fungi, 1497; Rav. Fung. Carol., 100; Thümen, Myc. Univ., 1115; Flor. Exs. Austro-Hung. 352 (mixed with *T. Caries*); Thümen, Fung. Austr., 373.

The specimen in Rabenh. Fung. Eur., 1697, communicated by Kühn, and also Berkeley's type, examined.

Fig. 19, spore of *T. lævis.*

2. **Tilletia verrucosa,** *Cooke & Massee in Grevillea* xvii. (1888), 16.—Spores-mass occupying the ovary, pale brown, foetid. Spores globose or subglobose, pale yellowish brown, 20–25 μ diam., bristling with large, acute, pyramidal warts about 3 μ high. —Sacc. Syll. ix. (1891), no. 1177.

Hosts.—*Panicum coloratum*, Linn.: *Ehrharta calycina*, Sm.

Hab.—Africa. Mozambique Distr., Portuguese East Africa, Lower Zambesi, between Lupata and Tete, *Kirk.* Cape Colony, in ovary of *Ehrharta* in herb. Thunberg.

Readily distinguished amongst species having warted spores by the pale yellowish brown or amber colour of the spores, and the large, pointed, pyramidal warts on the epispore. Type in herb. Kew.

Fig. 22, spore of *T. verrucosa.*

3. **Tilletia rotundata,** *Massee.*—Spore-mass occupying the ovary, dark brown; spores globose or angularly globose, 20–25 μ diam., yellowish-brown, translucent, wall thick, epispore densely covered with minute warts.—*Ustilago rotundata*, Arthur in Bull. Iowa Agric. Coll., 1884, 173.

Host.—*Panicum virgatum*, Linn.

Hab.—United States: Connecticut, South Manchester.

Exsicc.—Ellis & Everh., N. Amer. Fung., ser. 2, 1894.

Lacking the evidence afforded by germination, it is impossible to assign, with certainty, the generic position of this species; morphologically the spore characters indicate *Tilletia.*

4. **Tilletia mixta,** *Massee.*—Spore-mass blackish brown, formed in the ovary; spores globose, angularly globose, or broadly elliptic, averaging 16–18 μ diam., margin about 2 μ broad, deep chestnut brown, granulated or very minutely warted.—*T. fusca*, Ellis & Everh. in exsicc. not in Journ. Myc. iii. 55.

Host.—*Eriochloa annulata*, Kunth; *Festuca microstachya*, Desv.

Hab.—Australia; Murrumbidgee, *Bennett.* United States; Idaho, Boise City, *Ellis & Everhart.*

Exsicc.—Ellis & Everh., N. Amer. Fung. ser. 2, 1895.

Allied to *Tilletia de Baryana* in spore-structure, but quite distinct in the rich chestnut colour of the spore, the much smaller warts or granulations on the epispore, and in being produced in the ovary.

Fig. 10, spore of *T. mixta.*

5. **Tilletia Ayresii**, *Berk., MS. in herb. Kew.*—Spore-mass buff, produced in the ovary ; spores globose or broadly elliptic, 13–16 μ or 12–13 × 16 μ, border 1·5–2 μ broad, very pale straw-colour, densely covered with very minute warts.

HOST.—*Panicum maximum*, Nees.

HAB.—Mauritius ; Hills above Port Louis, *Ayres*, 4754 in herb. Berkeley.

Readily recognised by the small, almost colourless, warted spores. Type in herb. Kew.

6. **Tilletia magnusiana**, *Fischer de Waldh., Aperçu* (1887), 47.—Spore-mass produced in the ovary, blackish ; spores globose, ovoid, flattened or pointed, 10–14 μ diam., or up to 12 × 16 μ, clear yellow-brown, epispore very densely granulose or almost papillose.—Sacc. Syll. vii. (1883), no. 1777.

HOST.—*Panicum geniculatum*, Willd.

HAB.—Antilles.

Distinguished among species developing in the ovary of the host by the very finely papillose epispore. Not examined.

7. **Tilletia rugispora**, *Ellis in Journ. Myc.* vii. (1893), 275, figs. 8 and 9.—Spore-mass formed in the ovary, pale greyish brown ; spores almost uniformly globose, pale brown, 16–22 μ diam., border 2–2·5 μ wide, not paler, epispore densely covered with small, flat-topped, irregularly shaped warts of a brown colour, formed by the cracking of the epispore during the growth of the spore, interstices paler.—Sacc. Syll. xi. (1895), no. 1337.

HOSTS.—*Paspalum undulatum*, Poir.

HAB.—United States, Brazos Co., Texas.

Exsicc.—Ellis & Everh. N. Amer. Fung., 2704.

The ornamentation of the epispore is described by Ellis as "tuberculose-reticulate, the reticulations about 1 μ high and 1·5 μ broad.

The surface of the epispore is cracked in a tesselated manner, the top of the warts being dark, and the cracks separating adjacent warts paler, presenting, on a surface view the appearance shown in fig. 8. Authentic specimen from Ellis, and also specimen in N. Amer. Fungi, 2704, examined.

Fig. 8, surface of spore ; fig. 9, spore of *T. rugispora*.

8. **Tilletia de Baryana**, *Fischer de Waldh. in Bull. Soc. Imp. Nat. Moscow*, xl. (1867), 251.—Spore-mass blackish brown, forming elongated streaks on the leaves of the host plant ; spores globose, rarely irregularly globose or broadly elliptic, brown, 10–18 μ diam., border not obvious, epispore densely covered with minute dark-topped warts formed by the breaking up of the epispore.—Fischer

de Waldh., Aperçu (1877), 48. *T. striæformis*, Wint. in Rabenh., Krypt. Flora, Pilze, i. (1884), 108.; Sacc., Syll. vii. (1888), no. 1774. *T. Milii*, Fuckel, Symb. Myc. (1869), 40; Fischer de Wald., Aperçu (1877), 48. *T. Calamagrostis*, Fuckel, Symb. Myc. (1869), 40; Fischer de Wald., Aperçu (1877), 49; Sacc., Syll. vii. (1888), no. 1775. *T. serpens*, Karsten, Fung. Fenn. (1883), no. 599, with description. *T. aculeata*, Ule in Verhandl. bot. Ver. Brandenburg, 1884, 213, and in Hedwigia, 1886, 112; Sacc., Syll. vii. (1888), no. 1785, under "species minus notæ." *T. alopecurivora*, Ule in Verhandl. bot. Ver. Brandenburg, 1884, 214, and in Hedwigia, 1886, 113; Sacc., Syll. vii. (1888), no. 1787, under "species minus notæ." *T. Brizæ*, Ule in Verhandl. bot. Ver. Brandenburg, 1884, 214, and in Hedwigia, 1886, 113; Sacc., Syll. vii. (1888), no. 1786, under "species minus notæ." *Uredo striæformis*, Westend. in Bull. Acad. Belg. 1851, 406. *Ustilago Salveii*, Berk. and Broome in Ann. Nat. Hist., ser. 2, v. (1850), 463. *Ustilago macrospora*, Desmaz., Crypt. France, sér. i. (1850), no. 2127.

HOSTS.—A variety of grasses. Students of this genus have separated the forms chiefly by the hosts. There is no real difference, as far as I am aware; but for convenience of reference I class the hosts and forms together. As *T. de Baryana* (typical form), on *Anthoxanthum odoratum*, Linn., *Brachypodium pinnatum*, Beauv., *Festuca ovina*, Linn., *Holcus lanatus*, Linn., *H. mollis*, Linn, and *Lolium perenne*, Linn. As *T. striæformis*, on *Agrostis alba*, Linn., *A. vulgaris*, With., *Arrhenatherum avenaceum*, Beauv., *Briza media*, Linn., *Bromus inermis*, Leyss., *Dactylis glomerata*, Linn., *Deyeuxia halleriana*, Vaisey, *Festuca elatior*, Linn., *F. ovina*, Linn., *Holcus lanatus*, Linn., *H. mollis*, Linn., *Lolium perenne*, Linn., *Milium effusum*, Linn., *Phleum pratense*, Linn., *Poa pratensis*, Linn. As *U. Salveii*, on *Dactylis glomerata*, Linn., *Brachypodium pinnatum*, Beauv. and another grass. As *T. Milii*, on *Milium effusum*, Linn. As *T. Calamagrostis*, on *Agropyron repens*, Beauv., *Calamagrostis halleriana*, DC. and *C. lanceolata*, Roth. As *T. serpens*, on *Dactylis glomerata*, Linn. As *T. aculeata*, on *Agropyron repens*, Beauv. As *T. alopecurivora*, on *Alopecurus pratensis*, Linn. As *T. Brizæ*, on *Briza media*, Linn.

HAB.—Europe, except Russia and the Mediterranean region; United States.

Exsicc.—Under name of *Ustilago Salveii*, Cooke, Fung. Brit., 57; Westend., Herb. Crypt. Belg. 1164, Thümen, Fung. Aust., 840; Desmaz., Crypt. France, sér. 2, 1; Vize, Fung. Brit., 133. Under *Ustilago macrospora*, Desmaz., Crypt. France, sér. 1, 2127. Under *T. striæformis*, Rabenh.-Wint., Fung. Eur., 3503; Sydow, Myc. March., 1416, 1610, 2013, 2014, 3009; Ellis, N. Am. Fung., 1498. Under *T. de Baryana*, Rabenh., Fung. Eur., 1097, 2491, 3393; Westend., Crypt. Belg., 677; Thümen, Fung. Austr., 1230, and Fung. Univ., 1020; Sydow, Myc. March., 20, 26. As *T. Milii*, Fuckel, Fung. Rhen., 2410. As *T. Calamagrostis*, Fuckel, Fung. Rhen., 1925; Sydow, Myc. March., 2620; Zopf and Sydow, Myc. March, 10; Rabenh., Fung. Eur., 2694. As *T. aculeata*, Rabenh.-Wint., Fung. Eur., 3603. As *T. alopecurivora*, Sydow, Myc. March., 2120.

The types of most of these names have been seen. Berkeley's type is with his own specimens at Kew. Specimens illustrative of Desmazière's, Westendorp's, Fischer de Waldheim's, Fuckel's, Ule's and Karsten's names authenticated by these writers have been seen. Sydow's Myc. March., 2120, if correctly named, determines *T. alopecurivora* to be a form of *T. de Baryana*. Lastly, Ule's very unsatisfactory account of *T. Brizæ* makes this appear another form of the same species.

Fig. 6, sori ; fig. 7, spore of *T. de Baryana.*

9. **Tilletia arctica,** *Rostr. in Bot. Tidssk.*, 1886, 230.—Spore-mass forming black, very long, parallel streaks on the leaves and culms ; spores globose or ovoid, blackish-brown, 13–19 μ diam., epispore very minutely papillose.—Sacc., Syll. vii. (1888), no. 1781.

HOST.—*Carex festiva*, Dewey.

HAB.—Finland.

Appears to be allied to *Tilletia de Baryana* : not examined.

10. **Tilletia epiphylla,** *Berk. & Broome in Trans. Linn. Soc.*, ser. 2, (Bot.) ii. (1882), 67. Spore-mass subpulverulent, brown, forming elongated pustules on the leaves of the host ; pustules gregarious, each seated on a small yellow spot, narrow, 1–2 mm. long ; spores globose, 35–38 μ diam. ; wall thin, pale brown, translucent ; epispore with exceedingly minute warts.—Sacc., Syll. vii. (1888), no. 1783.

HOST.—*Zea Mays*, Linn.

HAB.—Queensland, *Bailey*, 228.

Berkeley and Broome describe the spores as smooth, but when carefully examined under a magnification of 400 diameters, the epispore is seen to be studded at regular intervals with very minute warts. The gregarious, small, linear pustules resemble a *Puccinia* superficially. Type specimen examined.

11. **Tilletia hyalospora,** *Massee.*—Spore-mass pale wood-colour, occupying the ovary. Spores globose or subglobose, 20–24 μ diam., border 2–2·5 μ wide ; surface reticulated ; there are usually 3–5 more or less parallel, simple or forked prominent ridges, connected by thinner and lower transverse bars.

HOST.—*Piptochætium* sp.

HAB.—Bolivian Andes, near Sorata, about 11,500 ft. *Mandon*, 1275.

Characterised by the type of ornamentation of the epispore. A primary band appears as if wound in an oblique spiral round the spore, as in the carpogonium of a *Chara*, the more or less parallel lines formed by this band being connected by thinner,

transverse bars. The specimen occurred in the ovary of a species of *Piptochætium* in Mandon's Plantæ Andinæ Bolivianæ. Type in herb. Kew.

Fig. 1, spore of *T. hyalospora.*

12. **Tilletia Lolii,** *Auersw. in Klotzsch, Herb. Myc.* (1854), 1999. —Spore-mass formed in the ovary, pale dull brown, foetid ; spores globose or sometimes broadly elliptic, pallid, averaging 20–25 μ diam., border 2·5–3 μ wide ; epispore furnished with thin ridges combined to form a shallow, small-meshed reticulation ; mesh averaging about 2 μ diam.—Fischer de Waldh., Aperçu (1877), 50 ; Wint. in Rabenh., Krypt. Flora, Pilze, i. (1884), 109 ; Sacc., Syll. vii. (1888), no. 1764.

Hosts.—*Lolium perenne*, Linn. ; *Lolium temulentum*, Linn.

Hab.—Germany.

Exsicc.—Klotzsch-Rabenh., Herb. Myc., 1999.

Distinguished by the pale colour of the spore-mass, and the pale ochraceous or almost colourless spores when viewed by transmitted light, the thin ridges, and small, shallow network. Specimen from quoted exsiccata examined.

Fig. 21, spore of *T. Lolii.*

13. **Tilletia controversa,** *Kühn in Rabenh. Fung. Eur.* (1874), no. 1896, with description. Spore-mass blackish, produced in the ovary, foetid ; spores almost uniformly globose, pale brown, 18–25 μ diam., margin 3 μ wide, not paler, epispore furnished with ridges anastomosing to form a rather large-meshed network, mesh averaging 3–3·5 μ diam. Mycelium perennial in the rhizome of the host-plant.—Fischer de Wald., Aperçu (1877), 49 ; Wint. in Rabenh., Krypt. Flora, Pilze, i. (1884), 110 ; Sacc., Syll. vii. (1888), no. 1765. *T. calospora*, Passerini in Grevillea, v. (1876), 47 ; Fischer de Waldh., Aperçu (1877), 48 ; Wint. in Rabenh., Krypt. Flora, Pilze, i. (1884) 110 ; Sacc., Syll. vii. (1888), no. 1767.

Hosts.—*Agropyron repens*, Beauv. ; *Agropyron glaucum*, Roem. & Schult. ; *Alopecurus agrestis*, Linn. ; *Elymus aralensis*, Regel.

Hab.—Italy, Germany, Austria, Turkestan.

Exsicc.—Rabenh., Fung. Eur., 1896 ; Roum., Fung. Sel. Gall., 4624 ; Flor. Exs. Austro-Hung., 351 ; Kunze, Fung. Sel., 210 ; Thümen, Myc. Univ., 1217 ; Rabenh., Fung. Eur., 2492 ; Roum., Fung. Gall. 1699.

Differs from *Tilletia endophylla* and from *T. Caries*, in the larger reticulations. *T. Rauwenhoffii* differs, on the other hand, from the present species in the much larger reticulations, and in the broader and almost colourless border of the spore.

The specimen of *T. controversa* in Rabenh., Fung. Eur., 1896, is authentic material and was communicated by Kühn. An authentic specimen of *T. calospora*, Passer., from the author also examined.

Fig. 18, spore of *T. controversa.*

14. **Tilletia cerebrina,** *Ellis and Everh. in Journ. Myc.* iii. (1887), 56.—Spore-mass formed in the ovary, dark brown or blackish; spores globose or sub-globose 23–28 μ and up to 30 μ long when ellipsoid, dark brown, border about 2·5 μ thick, paler; epispore ornamented with thickish ridges which are more or less sinuous and branched, the branches not unfrequently combining here and there to form an irregular reticulation, but free ends of the ridges are usually present in considerable numbers; mesh varying from 2–5 μ diam.—Sacc., Syll. vii. (1888), no. 1768.

Host.—*Deschampsia cæspitosa*, Beauv.

Hab.—United States; Rocky Mountain region.

Characterised by the bands on the epispore being irregularly branched and as a rule having numerous free ends, although in some spores the reticulation is fairly uniform and free ends rare or absent. Authentic specimen from Ellis examined.

Fig. 12, spore of *T. cerebrina.*

15. **Tilletia buchloeana,** *Keller & Swingle in Journ. Myc.* v. (1889), 11.—Spore-mass formed in the ovary, dirty brown; spores globose or very slightly oval, 16·5–18 × 20–21 μ, brownish; epispore marked with scattered regular spines or faint reticulations (formed by coalescence of the spines ·5–1·5 μ high, covered by the outer hyaline layer, which is 1·5–4 μ thick.—Sacc., Syll. ix. (1891), no. 1178.

Host.—*Buchloe dactyloides*, Engelm.

Hab.—United States; Kansas.

The fungus is borne on the male plants. In its presence often all or nearly all the staminate spikelets produce the ovaries, all of which are infested. The few female plants collected in the same localities were free from the fungus (*Keller & Swingle*). Judging from the figures the spores are reticulated at maturity. Not examined.

16. **Tilletia separata,** *Kunze, in Josh. Kunze, Fung. Select. Exs.* (1874), 29.—Spore-mass formed in the ovary, blackish brown, foetid; spores globose, irregularly or angularly globose, or broadly elliptic, clear brown, 20–27 μ diam., border about 3 μ wide, not appreciably paler; epispore with raised ridges anastomosing to form an irregular, small-meshed network, mesh averaging 1·5–2·5 μ diameter.—Wint. in Rabenh., Krypt.-Flora, Pilze i. (1884), 111; Sacc., Syll. vii. (1888), no. 1766. *T. decipiens*, Wint. in Rabenh.,

Krypt. Flora, Pilze i. (1884), 111; Sacc., Syll. vii. (1888), no. 1762. *T. Secalis*, Kühn in Fischer de Waldh., Aperçu (1877), 50; Wint. in Rabenh., Krypt. Flora, Pilze i. (1884), 110; Sacc., Syll. vii. (1888), no. 1763. *Erysibe sphærococca a Agrostidis*, Wallr., Flora Germ. Crypt. iv. (1833), 213. *Uredo decipiens a*, Strauss in Wetterau Gesell. Ann. ii. (1810), 111. *Uredo Secalis*, Corda in Hlubek, Œconom. Neuigk, 1848, 9, t. i. *Uredo segetum var. decipiens*, Pers., Syn. Fung. (1801), 225. *Uredo (Ustilago) sphærococca*, Rabenh., Krypt. Flora, Pilze ii. (1846), 213.

HOSTS.—*Secale cereale*, Linn.; *Apera Spica-venti*, Beauv.; *Agrostis alba*, Linn.; *Agrostis vulgaris*, With. (*Agrostis pumila*, Linn., is a form of *A. vulgaris* dwarfed by the *Tilletia*).

HAB.—Britain, France, Germany, Switzerland, Russia.

Exsicc.—Rabenh., Fung. Eur., 2191; Zopf & Sydow, Myc. March. 19; Flor. Gall. et Germ. Exs., 786; Roum., Fung. Sel. Exs. 5,706; Josh. Kunze, Fung. Sel. Exs., 29.

Distinguished from *Tilletia Caries* by the wider border of the spore and the smaller reticulations. The spores of *Tilletia endophylla* resemble those of *T. separata;* the first named, however, differs in forming the spore-mass in the leaves and not the ovary of the host. Examination of material in the exsiccata quoted above has been made.

Figs. 17 and 20, spores of *T. separata*, in one case germinating.

17. **Tilletia Caries**, *Tul. in Ann. Sci. Nat.*, sér. 3, vii. (1847), 113, t. 5, figs. 1–16.—Spore-mass produced in the ovary, blackish, with an olive sheen, foetid; spores globose, brown, 17–22 μ diam., border 1–1·5 μ, not paler; epispore furnished with ridges anastomosing to form a rather large-meshed network; mesh often variable in size and form, averaging about 3–3·5 μ.—Fischer de Waldh., Aperçu (1877), 49. *T. Tritici*, Wint. in Rabenh., Krypt. Flora, Pilze, i. (1884), 110; Sacc., Syll., vii. (1888), no. 1760. *Lycoperdon Tritici*, Bjerk. in Act. Suec., 1775, 326; *Uredo Caries*, DC., Fl. France, vi. (1815), 78. *Uredo sitophila*, Ditm. in Sturm, Deutchl. Flora, Abt. 3, pt. 1 (1817), 69.

HOSTS. — *Triticum vulgare*, Vill.; *Triticum Spelta*, Linn.; *Triticum monococcum*, Linn.

HAB.—Britain, France, Germany, Austria, Italy, Belgium, Switzerland, Russia, Finland, Algeria, Queensland, Victoria, United States, Chile.

Exsicc.—Rabenh. Fung. Eur., 2395; Cooke, Brit. Fungi, 53; Cooke, Fung. Brit., ed. 2, 429; Briosi e Cavara, Fung. Parasit., 155 (with figs.); Ellis and Everh., N. Amer. Fungi, 3236; Roum., Fung. Gall. Exs., 1645; Fuckel, Fungi Rhen., 252; Thümen, Myc. Univ., 724; Sydow, Myc. March., 2621; Vize, Fung. Brit., 130; Berk., Brit. Fungi, 113; Desm., Crypt. France, sér. 1, 124; Thümen, Fung. Austr., 343; Zack, Leiner u. Sitzenb., Krypt. Badens, 401; Sacc., Myc. Ven., 1153 (mixed with *Tilletia lævis* Kühn); Holl, Schmidt und Kunze, Deutschl. Schwamme, 190.

Remarkable for the narrow coloured border of the spore. Somewhat resembling in spore-characters *Tilletia endophylla.* The spores of the latter are, however, larger, darker in colour, with a wider border, and altogether larger in size; moreover, *T. endophylla* forms elongated blackish streaks on leaves, and is not produced in the ovary.

Fig. 13, *T. Caries* in an ear of wheat; fig. 14, spore; fig. 15, two sporidia after conjugation.

18. **Tilletia Elymi,** *Dietel and Holway in Bot. Gaz.*, xix. (1894), 305.—Spore-masses black, destroying the ovaries; spores globose, dark olive brown, 24–28 μ diameter. Epispore reticulated with ridges 2·6–4 μ high and about 3 μ apart.—Sacc., Syll. xi. (1895), no. 1338.

Host.—*Elymus* sp.

Hab.—United States; Skamania co., Washington State, *W. N. Suksdorf.*

Appears to be closely allied to *Tilletia controversa*, Kühn, which has also been recorded as occurring in the ovary of a species of *Elymus*. Not examined.

19. **Tilletia inolens,** *McAlpine in Agric. Gaz. of N. S. Wales*, vii. (1897), 154, figs. 30–33.—Produced in inflorescence and on upper leaves, black, powdery, without smell. Mycelium septate, hyaline, 4–5 μ thick. Spores globose, dark brown, 28–36 μ diam., average 33 μ; ridges of epispore 4 μ high, yellowish brown; meshes polygonal, about 4–5 μ diameter.

Host.—*Deyeuxia Forsteri*, Kunth.

Hab.—Victoria, Ardmona.

Not examined. Appears to be most closely allied to *T. Rauwenhoffii*, Fischer de Waldh.

20. **Tilletia Rauwenhoffii,** *Fischer de Waldh., Aperçu* (1877), 50.—Spore-mass produced in the ovary, blackish; spores almost constantly globose, olive-brown, 25–30 μ diam.; border almost colourless, 3–4 μ wide; epispore ornamented with prominent ribs anastomosing to form a network of large irregularly hexagonal reticulations; mesh averaging 3·5–4 μ diameter.—Sacc., Syll. vii. (1888), no. 1769. *Polyactis Holci*, Westend. in Bull. Acad. Belg., sér. 2, xi. (1889) 660, fig. 1.

Hosts.—*Holcus lanatus*, Linn., *Holcus mollis*, Linn.

Hab.—Belgium, England, Ireland.

Exsicc.—Rabenh.-Wint., Fung. Eur., 3104; Roum., Fung. Gall., 3509.

Readily distinguished by the very large size of the network on the epispore, usually only 4–6 areolæ being present on a

hemisphere; also by the very wide, almost colourless, border. Authentic specimens from Westendorp and Fischer de Waldheim examined.

Fig. 4, spore of *T. Rauwenhoffii;* fig. 5, the fungus on *Holcus mollis.*

21. **Tilletia fusca,** *Ellis & Everh. in Journ. Myc.* iii. (1887), 55.—Spore-mass occupying the ovary, dark olive-brown; spores globose or sub-globose, 16–25 μ diam., brown border about 2 μ broad, paler; the epispore ornamented with raised ridges anastomising to form an irregular network; mesh averaging 3 μ diameter.—Sacc., Syll. vii. (1888), no. 1771. *T. asperifolia*, Ellis and Everh. in Journ. Myc. iii. (1887), 55; Sacc., Syll. vii. (1888), no. 1772. *T. montana*, Ellis and Everh. in Journ. Myc. iii. (1887), 55; Sacc. Syll. vii. (1888), no. 1773.

HOSTS.—*Festuca microstachya*, Desv. (?); *Sporobolus asperifolius*, Nees and Meyen; *Sporobolus gracillimus*, Vasey.

HAB.—United States, Rocky Mountain region.

Allied to *Tilletia Caries*, but distinguished by the spore-mass not being foetid, the larger spores, larger and more irregular reticulations, and border paler than the remainder of the spore. Specimens illustrating the species and its two synonyms enumerated above were received from Ellis. The specimen from the author called *T. fusca*, agrees exactly with the original description of this species in *Journ. Myc.* iii. (1887), 55. On the other hand, further material issued under the name of *Tilletia fusca* (Ellis and Everh., N. Amer. Fung., ser. 2, 1895, in ovary of *Festuca microstachya*, from Boise City, Idaho) does not at all agree with the diagnosis of the species as quoted above, but has the epispore densely and minutely warted, and is identical with *Tilletia mixta*, Massee.

The priority of the specific name *fusca* turns on this name standing first in order on the same page where *montana* and *asperifolia* are also described.

Fig. 11, spore of *T. fusca.*

22. **Tilletia Hordei,** *Körn. in Hedwigia*, 1877, 30. Spore-mass formed in the ovary, blackish-brown; spores globose or broadly elliptic, brown 19·5–20·5 μ diam., or 19 × 21 μ, border about 2·5 μ thick, epispore covered with a small-meshed network; mesh averaging 2 μ diameter.—Sacc. Syll. vii. (1888), no. 1770. *T. Trabuti*, Jaczewski in Bull. Soc. Myc. France, ix. (1893), 50.

HOSTS.—*Hordeum fragile*, Boiss.; *Hordeum murinum*, Linn.

HAB.—Turkey, Assyria, Algeria.

Closely resembling *Tilletia Caries* in spore-structure; the border is a little wider in the present species. Specimen from Algiers examined.

Fig. 24, spore of *T. Hordei.*

23. **Tilletia zonata**, *Brefeld, Unters. Mykol.* xii. (1895), 161, t. x., figs. 3–7.—Spore-mass formed in the flower-bud, blackish; spores globose, 15-18 μ diam., with a thin external gelatinous layer; epispore brown, furnished with slightly raised ridges anastomosing to form a network.—Hedwigia, Beibl. (Elench. Fung. nov.), 1896, xxi.

HOST.—*Sporobolus ligularis*, Hackel.

HAB.—Ecuador.

The above is vaguely and briefly described by Brefeld in the work quoted; the mode of germination is however given in detail, and beautifully illustrated. Apparently closely allied to *Tilletia fusca*.

24. **Tilletia endophylla**, *de Bary in Rabenh., Herb. Myc.*, ed. 2, 500.—Spore-mass forming blackish-brown streaks on the leaves of the host 1–3 cm. long; spores globose, angularly globose, or broadly ellipsoid, 18–25 μ diam., border about 2 μ wide, altogether brown; epispore ornamented with a rather small-meshed reticulation, the walls of which are thickish; mesh averaging about 2 μ diameter.—Fischer de Waldh., Aperçu (1877), 49; *T. olida*, Wint. in Rabenh., Krypt. Flora, Pilze, i. (1881), 107; Sacc., Syll. vii. (1888), no. 1761; *Uredo olida*, Riess, in Klotzsch-Rabenh., Herb. Myc., 1695.

HOSTS.—*Brachypodium pinnatum*, Beauv.; *Brachypodium sylvaticum*, Beauv.

HAB.—Austria, Germany.

Exsicc.—Klotzsch-Rabenh., Herb. Myc., 1695; Rabenh., Herb. Myc., ed. 2, 500; Rabenh., Fung. Eur., 2293; Rabenh.-Wint., Fung. Eur., 3703.

The only species with reticulated spores that forms long sori, or streaks, on leaves. The reticulations are smaller and more numerous than in *Tilletia Caries*. Specimens from the exsiccata quoted above, examined.

Fig. 16, spore of *T. endophylla*.

25. **Tilletia Sesleriæ**, *Juel in Öfvers. af Kongl. Vet. Akad. Förhandl. Stockholm*, 1894, 494.—Spore-mass forming very long, thin black streaks on the leaves; spores irregularly globose, dark brown, 25–28 μ diam., epispore furnished with ridges which anastomose to form a network.

HOST.—*Sesleria cœrulea*, Ard.

HAB.—Gothland.

The author compares this species with *Tilletia endophylla*, Wint., from which it differs more especially in the larger spores. Not examined.

26. **Tilletia Berkeleyi**, *Massee.*—Spore-mass forming blackish streaks on the culm, up to 1 cm. long, not foetid when moistened; spores constantly globose, brown, 15–18 μ diam., border 1 μ wide,

epispore furnished with very thin, slightly raised ridges, which anastomose to form a very small-meshed network ; mesh averaging 1·5 μ diameter.

HOST.—*Triticum vulgare*, Vill.

HAB.—England ; King's Cliffe, Northamptonshire, *Berkeley*.

A very distinct species, included by Berkeley under *Tilletia Caries*, in his herbarium. Differs from the last-named, and from all other described species in the small-sized spores, and in the very small mesh formed by the thin, slightly raised ridges on the epispore. Forming blackish lines on the culm ·5–1 cm. long.

Fig. 23, spore of *T. Berkeleyi*.

27. **Tilletia Sphagni**, *Nawaschin in Bot. Centralbl.* 43 (1890), 289.—Spore-mass brown, filling the capsules of *Sphagnum ;* spores globose, 11–12 μ diam. ; epispore clear brown, ornamented with a polygonal network.—Sacc. Syll. ix. (1891), no. 1180.

HOST.—*Sphagnum squarrosum*, Pers.

HAB.—Russia.

This species is probably widely diffused, although only definitely recorded from Russia. The *Tilletia* spores are those bodies which have previously been spoken of as the microspores of *Sphagnum*, and the capsules in which they are produced were known as microsporangia. Not examined.

Doubtful Species.

28. *Tilletia Avenæ*, Ule in Hedwigia, 1886, 113 ; Sacc. Syll. vii. (1888), no. 1784.

There is no published description of this species.

29. *Tilletia Fischeri*, Karsten in Finska Vetenskaps-Societeten, 1879, 10 ; Myc. Fenn. iv. p. 10.—Spore-mass formed in the ovary, black ; spores globose or sub-globose, brown, about 14 μ diam. or 16 × 12 μ.—Sacc., Syll. vii. (1888), no. 1799.

HOST.—*Carex canescens*, Linn.

HAB.—Finland.

The brief and incomplete diagnosis prevents placing this species in any one section employed in the present paper, and it is not wise to trust to the host for the discrimination of a species.

30. *Tilletia Vulpiæ*, P. Magnus in Verhandl. d. Zool.-Bot. Gesell. Wien, xlix. (1899), 89, t. 2, figs. 7–12. Spore-mass produced in the ovary, blackish, 19·2 × 16·9 μ ; epispore with a raised network.

HOST.—*Festuca Myurus*, Linn.

HAB.—Kurdistan.

Not examined. The diagnosis is too vague to admit of indicating its affinities.

Excluded Species.

31. *Tilletia corona*, Scribner in Bot. Gaz. xxiii. (1896), 210.

HOSTS.—Infesting the ovary in *Leersia oryzoides*, Swartz; *L. virginicus*, Willd.; *L. lenticularis*, Michx.; *Panicum virgatum*, Linn.; *P. sanguinale*, Linn.; and *Oryza sativa*, Linn.

HAB.—United States.

Exsicc.—Ellis, N. Amer. Fung., 1896.

This is obviously a species of ***Neovossia***, and will stand as *Neovossia corona*. The specimen in Ellis, N. Amer. Fung. 1896, examined.

32. *Tilletia* (?) *glomerulata*, Cocc. et Mor., Enum. Funghi, Bologna, Cent. ii., 6, tab. 1, figs. 1–3; Sacc., Syll. vii. (1888), no. 1782.

Judging from the description and figures, this is certainly not a species of *Tilletia*.

33. *Tilletia? irregularis*, Pazschke in Rabenh.-Wint.-Pazschke Fung. Eur. et Extra-Europ., 4004 (with description); Hedwigia, Beibl. (Elench. Fung. nov.), 1896, xxi.

HOST.—On living leaves of *Andropogon* sp.

HAB.—Brazil; Sta. Catharina.

Examination of material from the exsiccata quoted above shows very clearly that the fungus is not a *Tilletia*, but some Hyphomycetous form with dark olive spores arranged in lines, and distinctly springing from a pseudoparenchymatous stroma immersed in the substance of the leaf.

34. *Tilletia **Moliniæ***, Wint. in Rabenh., Krypt. Flora, Pilze, i. (1884), 109; Sacc., Syll. vii. (1888), no. 1778. *Neovossia Moliniæ*, Körn. in Oester. Bot. Zeitschr. xxix. (1879), 217; Brefeld, Unters. Mykol. xii., 210, t. x., fig. 8–28. *Vossia Moliniæ*, Thümen in Oester. Bot. Zeitschr. xxix. (1879), 18.

HOST.—In ovary of *Molinia cærulea*, Moench.

HAB.—Carniolia.

EXSICC.—Roum., Fung. Sel., 4922 (comm. Voss); Flor. Ex. Austro-Hung., 353 (comm. Voss); Thümen, Fung. Austr., 1216.

This species differs from *Tilletia* in the mode of spore-germination, and must consequently return to *Neovossia*; *Vossia*, the name originally given by Thümen, being already used for a genus of grasses. Portion of the type specimen sent by Thümen to Herb. Kew, also the material in the quoted exsiccata, examined.

Figs. 2 and 3, spores of *Neovossia Moliniæ.*

35. *Tilletia Orizæ,* Pat. in Bull. Soc. Myc. France, iii. (1887), 124, t. x., fig. 2.—Spores globose or ovoid, 3–5 μ diam., olive brown, warted, united into a hard blackish green mass, mixed with slender hyaline filaments with an irregular outline.—Sacc., Syll. ix (1891), no. 1179.

HOST.—Attacks the fruit of rice, *Oryza sativa*, Linn., which becomes enlarged, black, and hard like a sclerotium.

HAB.—Japan ; Environs of Yokosha, Island of Nippon.

The description proves that this fungus is not a *Tilletia*, in fact it forms the type of a new genus—*Ustilaginoidea*, established by Brefeld, who cannot indicate its affinities. There are two species, *U. Oryzæ* and *U. Setariæ.* Perhaps it would have been wiser not to have established a new genus until it could have been diagnosed by other features than spore-germination alone. Every mycologist is deeply indebted to Brefeld for his marvellous researches on spore-germination, but as to whether mycologists have accepted the idea that everything systematic rests on this one feature, or whether it is really to be regarded as the fundamental and only feature of value, remains yet to be decided.

36. *Tilletia sterilis*, Ule in Verhandl. bot. Ver. Brandenburg, 1884, 214 ; Hedwigia, 1886, 114 ; Sacc., Syll. vii. (1888), no. 1788, under "Species minus notæ."

HOST.—*Festuca ovina*, Linn. ; *Kœleria cristata*, Pers.

HAB.—Germany.

Exsicc.—Rabenh.-Wint., Fung. Eur., 3605 (comm. Ule).

The different accounts of this hypothetical species, as given by Ule, are very unsatisfactory. The author on finding certain black streaks on leaves appears to have assumed that a *Tilletia* was the cause, but lacking satisfactory evidence called the species *sterilis*, probably as a reproach for its sterility. The specimen furnished by Ule to Rabenhorst's exsiccata conforms with the specific name, and may, so far as the Kew copy is concerned, be described as *sterilis.*

37. *Tilletia Thlaspeos*, Beck in Verhandl. Zool.-Bot. Gesell. Wien, 1885, 361.—Spore-mass ochraceous, produced in the ovules ; spores globose or rarely subglobose, ochraceous, semipellucid, 14·7–17·5 μ diam. ; epispore densely verruculose-aculeate.

HOST.—*Thlaspi alpestre*, Linn.

HAB.—Austria.

Developing in ovules of scarcely deformed fruit of *Thlaspi alpestre.* Not examined. Judging from the description, the present fungus is not a *Tilletia* but a *Sorosporium.*

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Specific names in *italics* are those not retained.

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Fig. 1. Spore of *Tilletia hyalospora*, × 750.
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" 3. The same in a very young stage, × 750.
" 4. Spore of *Tilletia Rauwenhoffii*, × 750.
" 5. Part of *Holcus mollis* infected with *T. Rauwenhoffii*, slightly enlarged.
" 6. Sori of *Tilletia de Baryana* on leaf of *Dactylus glomerata*, nat. size.

Fig. 7. Spore of *Tilletia de Baryana*, × 750.
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DCLVII.—CENTRAL AMERICAN RUBBER.

(*Castilloa elastica*, Cerv.)

Some account of *Castilloa* rubber, and of the species producing it, was given in the *Kew Bulletin* for 1887, pp. 13–16. Since then its cultivation as a source of rubber-supply has attracted some attention in Mexico and the West Indies. It has not, however, been easy to obtain any trustworthy data as to the practical methods to pursue or as to the cost and return to be expected. The following account is therefore reprinted from the United States Consular Reports (May, 1899, pp. 147–151). It appears to have been drawn up by a man conversant with the subject and with a good deal of care :—

" Consul-General Beaupré sends from Guatemala, under date of January 28, 1899, a translation of an article on rubber prepared by Mr. José Horta, of the city of Guatemala. Mr. Horta, adds the Consul-General, is an experienced agriculturist, and has handled the subject ably. Extracts from his report are given below.

" In Guatemala *Castilloa elastica*, Cerv., is found in the wild state, and covers an immense zone in Central America; the rubber which this tree produces is one of the best and most valuable for the industry.

" The *Castilloa elastica* is a tall, well-shaped tree, with smooth, greenish-white bark. At a height of from 15 to 20 yards from the ground there start from the trunk (of spongy and porous

wood) large and almost horizontal branches, from which hang two rows of leaves, long, oval in shape, and smooth edged (not toothed).

"The milk of the rubber tree, or its mercantile product, is contained principally in the fibres between the woody portion of the tree and the bark. This fibrous part is a vital portion of the tree. For this reason, in making incisions in the bark to obtain the milk, it is necessary to proceed with great caution and according to the method described further on.

"The milk contains more or less water, according to the time of its extraction; on an average it can be calculated to hold about 60 per cent. water and other substances, and 40 per cent. saleable product; of this, approximately 33 per cent. is rubber of superior quality.

"The climate most appropriate for rubber is the hot or coastal, with a temperature of from 25° to 35° Celsius (93° to 103° F.) and the altitude above sea level up to 1,500 feet. The ground should be moist, deep, and loose; neither clay nor stone. Rubber should not be planted in the sun, We found our opinion upon the following reasons:—

"(1.) The nature of the rubber tree.
"(2.) The trials made in Guatemala since 1872.
"(3.) The consideration that, planting in the shade, there is absolute certainty of a satisfactory result.

"If the wild tree always seeks the shade of trees of greater growth in the natural forests, it is because, by the help of these, its sap remains in the state imposed by nature as a condition of its proper growth and production. It is not the desire here to make a detailed study of the tree; but we wish to note that its leaves do not resist the sun, nor do they, by the nature of their surface, oppose evaporation. It is clear that without shade there is an evaporation which must exercise a harmful influence upon the production of the milk of the tree. It should also not be lost sight of that on the Pacific Coast we have a dry season for six consecutive months, very prejudicial to plantations in the sun. Allow the rubber tree a high and well-distributed shade, without undergrowth or brush, and the result will be healthy and robust trees of rapid growth, long life, and abundant yield. It is a mistake to wish to cultivate plants, such as coffee and rubber, requiring distinct climatical conditions, soil, and atmospheres, with the desire of obtaining good yields in both. The result is that neither one nor the other finds the requirements necessary for proper development. It would appear much more feasible to conduct the cultivation of vanilla simultaneously with that of rubber, utilizing the trees for shade.

"Advocating the planting in the shade is equivalent, in a country like Guatemala, still possessing so much virgin forest, to planting in the woods. There are thousands of acres of land where it would be sufficient to clear the forest (cutting down part and removing the low branches and undergrowth) in order to obtain ground sufficiently shaded and with the necessary ventilation, the latter a condition of the greatest importance. The trees and undergrowth cut down could be spread over the ground to

prevent the growth of weeds, as well as to serve as manure. In planting the rubber tree the ground should be perfectly cleaned for a circle at least a yard in diameter and the tree placed in the centre. We advise the planting of trees taken from a nursery, as incomparably better results will be obtained than by planting by seed. The nursery is formed in damp ground, shaded and well worked, and the seed (which is gathered here in March and April) planted at intervals of about a foot. The seed is planted just as gathered, with gum and all ; washing may injure the later growth and may even prevent sprouting. After a year in the nursery the trees are taken out with great care (it is best if the earth adheres to the roots) and transplanted.

"The least distance at which rubber trees should be set out is 6 yards apart, and they should be in straight rows so far as possible ; if a choice can be made, 8 to 10 yards would be preferable. During each of the first two years, from three to four cleanings should be made, these to consist principally of cutting with the machete the undergrowth which has sprouted, and covering the ground as has previously been explained. In the third and fourth years, two to three cleanings per year should be made ; and from the fifth year, one cleaning annually will suffice until the growth of the tree impedes the further development of weeds. Before beginning to exploit, the trunk of the tree should measure at least 12 inches in diameter, and from 12 to 15 yards in height, for which from nine to ten years is necessary.

"The milk may be extracted from the trees twice each year, during the rainy season ; about two months after its commencement and towards the termination, the most propitious time being when the tree has dropped its leaves.

"A tree planted and cultivated under good conditions will give an annual product, after nine or ten years, of 1 pound of rubber, or, say $2\frac{1}{2}$ to 3 pounds of milk. With proper study of the nature of the rubber tree, the progress of its sap, and the fertilizers that might be best for it, it is very probable that this yield would be greatly increased.

"EXTRACTION OF RUBBER.

"Until now, the machete has been used in Guatemala to make the incisions in the bark, incisions in the form of small canals about three-fourths of an inch wide, which receive the milk. In other countries (as in the East Indies) there is employed a kind of knife, which allows the making of an incision which is cleaner and better directed.

"To extract a good quantity of milk it is not sufficient to make only one incision at the foot of the tree. Care should be taken that the bark of the tree remains intact in one continuous strip the entire height of one side of the tree ; if the entire circumference of the trunk were cut (even by incisions situated at different heights), the tree would die within a few days. To avoid this danger we have seen the following modes employed :—

"(1.) From a certain height above the roots, incisions are made in the trunk every metre or metre and a quarter approximately, until within two metres of the first branches. Each incision

consists of two symmetrical cuts, which together will cover two-thirds of the circumference of the tree, and will form an angle of 45°, in order that the milk may run freely to the lowest point. The points of all the incisions must be in a perpendicular line, so that the milk from the highest incision, after concentrating in the angle formed by the two cuts, may run to the lowest point of the next lower incision, and from there on to the following, etc., until reaching the lowest, where it is collected, as explained further on.

"(2.) The incision is extended to the same height of the trunk as indicated in the first method, but is continuous, and consists of cuts, one perpendicular to the other, always taking care never to cut into more than two-thirds of the tree's circumference, thus leaving one-third of the bark intact.

"It is useless and even dangerous to make the incisions so deep as to penetrate the woody part of the tree. On the contrary, great caution should be exercised to preserve the fibres closest to the wood.

"From the point of the incision nearest the ground the milk is conducted by a canal to a receptacle of clay or wood. When collected thus, the milk must be coagulated to obtain the solid marketable product. This part of the process merits a serious study, as the best mode of obtaining the finest and most abundant product has not been decided. We limit ourselves to indicating the principal processes we have seen employed.

"The most rudimentary consists in collecting the milk in a trough, or even a hole excavated in the ground (which detracts from its value), and employing in its coagulation the juice of the vine, here called 'Quiebra-Cajete' (an infusion of the leaves of the vine). Alum can also be employed, and exercises a very rapid action on the milk. The water contained in the milk may be evaporated by indirectly applied heat, taking care that the receptacle does not communicate a bad colour to the rubber; or, the milk may be mixed with water, which is poured off at intervals, until all impurities are removed. The clean rubber, which presents the aspect of a spongy mass, is passed through a press to expel the water, thus obtaining a white product of superior quality, which is left to dry in the shade, in order that it may not show on the outside a glutinous liquid, which detracts from its market value.

"Cost and Probable Production of a Plantation.

"This calculation must naturally be incomplete, as the cost will depend in great part on the price of the lands, on the greater or less facilities for obtaining workmen, the mode of paying them (by day, by task, with advances, etc.), on the distance apart that trees are to be planted, whether the land is to be used exclusively for rubber or not, and on many other considerations.

"The figures expressed herewith, therefore, do not pretend to a rigorous exactitude, but will serve as a guide for the agriculturist.

"We will suppose that the trees are to be planted at 8 varas (1 vara = 33 English inches) distance, so that each will have an approximate area (with space occupied by shade trees) of 64 square varas, which we believe necessary for their proper development.

thus allowing approximately 10,000 trees to the caballeria (112 acres); cost of land at $400 ($175.60 in United States currency) * per caballeria, a price somewhat high, as some coast land (hot) adequate for this cultivation can be purchased in Guatemala for less; but we have adopted this figure, as, according to existing laws, it is the average cost of public lands in the Republic.

	Guatemalan currency.		United States currency.
	$		$
Cost per manzana †	6.25	...	2.74
Fencing per manzana...	10.00	...	4.39
Nursery, at $10 per 1,000, say, for 159 plants...	1.59	...	.69
Preparation of ground and arranging natural shade, per manzana ...	8.00	...	3.51
Planting 159 trees to the manzana ...	3.00	...	1.32
Cleaning by machete, four in first year	16.00	...	7.02
Three cleanings in second year ...	12.00	...	5.27
Two cleanings in third year	8.00	...	3.51
One cleaning each year from fourth to sixth, inclusive	12.00	...	5.27
Interest on invested capital, at 10 per cent. for ten years	68.78	...	30.19
Management, etc.	4.38	...	1.92
Total cost in Guatemala (200 per cent. premium is ruling rate on gold to-day) of 159 trees occupying a manzana of ground, and 10 years old	150.00	...	66.00

"From the foregoing calculation it may be seen that a plantation of, say, 100,000 trees requires 10 caballerias of ground (besides that which may be necessary for buildings, huts, etc.), and would cost, after ten years, about $95,000 ($41,700).

"If the annual yield of each tree after ten years is 1 pound of rubber of good class, 100,000 trees would give 1,000 centals per year of good rubber. At present price of the article, these 1,000 would be valued in Guatemalan money at to-day's exchange $262,500 ($115,238). There is to be deducted from this:—

	Guatemalan currency.		United States currency.
	$		$
Cost of extraction and collection of the milk and manufacture of product (which together may be calculated at 30 cents per pound of rubber) for 1,000 centals	30,000	...	13,170

* The value of the Central American peso, or dollar, was estimated by the United States Director of the Mint, January 1st, 1899, at 43.9 cents.

† Square of 100 varas, or 275 feet.

	Guatemalan currency.		United States currency.
	$		$
Brought forward	30,000	...	13,170
Expense of transportation to point of shipment (which varies in each case, but can be calculated in lands situated on the Pacific coast at $1.50 to $2 per cental) for 1,000 centals	1,750	...	768
Expense for embarking, more or less, 80 cents per cental, or, for 1,000 centals	809	...	355
Ocean freight, insurance, commission on sales, and other expenses, approximately	40,000	...	17,560
Total	72,559	...	31,853

"Deducting the cost of $72,559 ($31,853) from the income, leaves a balance of $189,941 ($83,385).

"According to these calculations, one crop, after ten years, will produce double the amount expended during that time. Even reducing these figures (which are not too high) to one-half, in order to be free from any exaggeration, and supposing a yield per tree of 6 ounces of good product, the net annual product will be incomparably more remunerative than that which coffee under the best and most favourable circumstances can yield."

DCLVIII.—FUNGI EXOTICI, II.

Persia.

Uredineæ.

Puccinia decipiens, *Massee* (*sp. nov.*). *Sori* amphigeni, minuti, gregarii, orbiculati, atro-brunnei, sæpe epidermide cincti, 1–2 mm. diam. *Teleutosporæ* ovoideæ vel suboblongatæ, vertice rotundatæ nec incrassatæ, medio septatæ pleræque vix constrictæ, fuscæ, 50–55 × 28–32 μ, episporio leves, basi in pedicellum hyalinum 60 × 6–7 μ productæ.

South Persia. Province of Kerman, 10,000 ft., on leaves of *Taraxacum montanum*, C. A. Mey., *Bornmüller*, 5138.

Somewhat resembling *P. Prenanthis*, Fuckel, in habit and general appearance, but differing in the structure of the teleutospores.

Russian Asia.

Basidiomycetes.

Paxillus Osteopæon, *Massee* (*sp. nov.*). *Pileus* carnoso-lentus vel sub-coriaceus, planus vel depressus, margine arcte involuto sericeo glabratove, sordide albidus, 3–4 cm. diam. *Lamellæ* attenuato-decurrentes, confertæ, passim ramosæ anastomosantes. *Sporæ* subglobosæ, 4–5 μ diam. *Stipes* curtus, solidus, glaber, fuscescens.—*Kew Bulletin*, 1899, p. 56.

MONGOLIA. *Mrs. Kemp.*

Growing almost buried in loose sand; said to be used extensively and with beneficial results in the treatment of diseased bones.

Tibet.

Basidiomycetes.

Clavaria fusiformis, *Sowerby*, *Eng. Fungi* (1799) t. 234.
S. TIBET. Yatung, *Hobson.*

Japan.

Uredineæ.

Puccinia Polygoni, *Pers. Syn.* (1801) p. 227 (P. Polygoni-amphibii, *Pers.*, l.c.).

YESSO. Abashiri, on *Polygonum sachalinense*, F. Schmidt, *Faurie*, 13,856.

India.

Basidiomycetes.

Pleurotus cretaceus, *Massee* (*sp. nov.*). *Pileus* carnoso-lentus, sicco rigidus, subrotundus, uno latere productus, margine involuto, plano-convexus, sæpe tumulosus, glaber, albidus, 6–9 cm. diam. *Lamellæ* confertæ, attenuato-decurrentes, postice anastomosantes, albidæ. *Sporæ* ovato-ellipticæ, hyalinæ, glabræ, 3 × 4 μ. *Stipes* excentricus, sæpe fere lateralis, glaber, albidus, 3–5 cm. longus, 2–3 cm. crassus, deorsum attenuatus, siccitate longitudinaliter rugulosus.

PUNJAB. Peshawar, on wood, *Watt*, 10339.

A very remarkable fungus, entirely creamy white. Very rigid when dry, and looking exactly like a plaster of Paris model. Allied to *P. sapidus*, Kalchbr. Dr. Watt's note accompanying the specimen is as follows: "It comes from Peshawar, where it is

known as 'Dhingri.' It is said to be sold by the shopkeepers much broken. The average rate at which it is sold is about Rs.$2\frac{1}{2}$ a seer. Before cooking it is soaked in fresh water for about eight hours. It then swells and becomes pulpy. It is said to be eaten with great relish and sent as a rarity in presents to friends all over India."

Volvaria woodrowiana, *Massee* (*sp. nov.*). *Pileus* carnosulus, campanulatus, dein explanatus, siccus, margine striatus, glaberrimus, griseo-lividus vel cinereus, 8–12 cm. diam. *Lamellæ* postice liberæ, ventricosæ, confertæ, salmonicolores, acie integra. *Sporæ* sphæroideo-ellipsoideæ, rubellæ, 10 × 8 μ. *Stipes* solidus, subæqualis, glaber, 9–15 cm. longus, 1 cm. circiter crassus, albus. *Volva* amplissima, libera, vaginalis, limbo lobata, albida.

BOMBAY. On the ground, Poona, *Woodrow*, 13.

Allied to *V. volvacea*, Bull.

Hydnum Gleadonii, *Massee* (*sp. nov.*). *Pilei* subcoriacei, sessiles, dimidiati, imbricati, strigoso-spongiosi, ex albo flavidi, margine flavi, 4–7 cm. lati. *Aculei* ex albo flavidi, usque ad 1 cm. longi, decurrentes, apice integri acuti. *Sporæ* hyalinæ, subglobosæ, 5 × 4 μ.

N. W. PROVINCES. On dead wood, Dehra Dun, *Gamble*, 26,475 (coll. F. Gleadon).

A very beautiful species, quite distinct in colour, and in the peculiar strigose covering of the pileus, which approaches in character that of *Trametes Hystrix*, Cooke.

Geaster lilacinus, *Massee* (*sp. nov.*). *Peridium* globosum, subumbonatum, 2 cm. diam.; exoperidium rigidum, carnosum, stellatim laciniatum, laciniis siccitate arcte involutis; endoperidium globoso-depressum, mammillatum, papyraceum, corrugatum, argenteum; ostiolum minutum; columella evanescens. *Sporæ* globosæ, brunneo-lilacinæ, verrucosæ, 10–12 μ diam.

N. W. PROVINCES. On the ground, Dehra Dun, *Gamble*, 26,465.

A small species somewhat resembling *G. hygrometricus*, Pers., but readily distinguished from this and every other known species by the very large size of the spores. In the mass the spores are dark brown with a lilac tinge.

HYPHOMYCETES.

Helminthosporium obclavatum, *Massee* (*sp. nov.*). *Hyphæ* rigidulæ, simplices, fasciculares, fuscæ, opacæ, sursum attenuatæ, 350–400 × 12–14 μ, maculas aterrimas velutinas formantes. *Conidia* elongato-obclavata, 7–11-septata, pallide olivacea, 80–120 × 18–20 μ.

N. W. PROVINCES. On branches of *Helicteres Isora*, Linn., Siwalik Hills, *Gamble*, 26,477.

Resembling *H. velutinum*, Link, in habit and colour, but differing in the larger pale conidia.

Coniosporium Arundinis, *Sacc. in Michelia* ii. (1882) p. 124.

N. W. PROVINCES. On culms of *Thysanolæna Agrostis*, Nees, Dehra Dun, *Gamble*, 26,566.

Trichosporium purpureum, *Massee* (*sp. nov.*). *Hyphæ* steriles copiosæ, repentes, pluries vage ramosæ, septatæ, hyalinæ, 4–5 μ crassæ. *Conidia* elliptica, levia, fusco-purpurea, $7 \times 4\ \mu$, in ramulis brevibus subglobosis inserta, acrogena.

N. W. PROVINCES. On dead wood; Dehra Dun, *Gamble*, 26,469.

Forming pulverulent patches 10–15 cm. across. Spores dark purple in the mass.

Trichosporium aterrimum, *Massee* (*sp. nov.*). *Hyphæ* steriles repentes, pallidæ, septatæ, 3·5–4 μ crassæ, vage ramosæ; hyphæ fertiles subsimplices, hyalinæ. *Conidia* elliptica, glabra, brunneo-olivacea, acrogena, $7–8 \times 4\ \mu$.

PUNJAB. On *Morus indica*, Linn., Changa Manga, *Gamble*, 26,476.

First attacking the cambium, which is destroyed, and then in dense jet-black pulverulent patches the fungus appears on both surfaces of the loose bark. In acting thus, the fungus eventually kills the tree.

Hymenopsis Cudraniæ, *Massee* (*sp. nov.*). *Sporodochia* convexula, superficialia, atra, 2–4 mm. diam., gregaria, epiphylla, maculas pallidas incrassatas formantia. *Conidia* ovoidea, glabra, olivacea, $3·5 \times 2\ \mu$, conidiophoris cylindricis suffulta.

N.W. PROVINCES. On living leaves of *Cudrania javanensis*, Trécul, Dehra Dun, *Gamble*, 26,473.

The fungus is a true parasite forming black irregular patches, crowded on thickened yellowish blotches 1–3 cm. across.

Sphacelia Oryzæ, *Massee* (*sp. nov.*). *Sporodochia* effusa, olivacea, suffulta hypostromate aurantiaco duro. *Conidiophora* brevia, simplicia, hyalina, bacillaria, $5–6 \times 1·5\ \mu$. *Conidia* solitaria, acrogena, globosa, verruculosa, sub lente pallide olivacea, 3·5–4 μ diam.

ASSAM. On the glumes of cultivated rice, North Lushai, *Watt*, 10,179.

This parasite is in all probability a conidial condition of some undescribed species of *Claviceps*.

STRAITS SETTLEMENTS.

BASIDIOMYCETES.

Mycena pelliculosa, *Sacc. Syll.* v. (1887) no. 295.

PERAK. On rotten wood, *Ridley*, 13.

Mycena repertitia, *Massee* (*sp. nov.*). *Pileus* membranaceus, cylindricus, obtusus, glaber, striatus, striis e margine ad umbonem productis, albo-roseus, ad umbonem roseus, 5–8 mm. diam. *Lamellæ* subdistantes, angustæ, adnato-annexæ, albidæ. *Sporæ* ellipticæ, albo-roseæ, $7 \times 4\ \mu$. *Stipes* fistulosus, æqualis, albidus, glaber, 2–4 cm. longus, 2 mm. crassus.

PERAK. On rotten wood, *Ridley*, 21. Distinguished by the rose-coloured cylindrical pileus, striate from the margin to the minute umbo.

Allied to *M. codoniceps*, Cooke.

Mycena crassipes, *Massee* (*sp. nov.*). *Pileus* carnosulus, conico-campanulatus, dein expanso-umbonatus, striatus, glaber, e flavido pallidus albidusve, 2–3 cm. latus. *Lamellæ* confertæ, angustæ, postice annexæ, albidæ, ætate lutescentes, venoso-conjunctæ. *Sporæ* hyalinæ, ellipticæ, 8 × 5 μ. *Stipes* solidus, obesus, rigido-compactus, glaber, albo-flavus, sursum subattenuatus, 4–5 cm. longus, 7–8 mm. crassus.

SELANGOR. On stumps, *Ridley*, 65.

Remarkable for the thick, solid stem. Allied to *M. rugosa*, Fries.

Mycena gigantospora, *Massee* (*sp. nov.*). *Pileus* membranaceus, campanulatus, dein expanso-umbonatus, ad umbonem striatus, griseo-brunneus, umbone quam margine atriore, pruina grisea primo tectus, 2–3 cm. diam. *Lamellæ* subconfertæ, adnato-uncinatæ, cinereo-fuscæ. *Sporæ* ovatæ, hyalinæ, glabræ, 12–14 × 8–9 μ. *Stipes* fistulosus, glaber, æqualis, sursum pallidus, deorsum brunneus, basi albo-lanatus, 4–5 cm. longus, 3–4 mm. crassus.

PERAK. On the ground, *Ridley*, 3.

Distinguished from all known species by the brown colour of every part, and by the large spores.

Omphalia tenera, *Massee* (*sp. nov.*). *Pileus* submembranaceus, griseus, e convexo campanulato-umbilicatus, glaber, margine striatus, 5–9 mm. diam. *Lamellæ* distantes, decurrentes, albidæ. *Sporæ* globosæ, glabræ, hyalinæ, 7 μ diam. *Stipes* cavus, glaber, albidus, 3–3·5 cm. longus, 2 mm. crassus.

PERAK. On rotten wood, *Ridley*, 9.

Allied to *O. grisea*, Fries, from which it differs in the globose spores, and the umbilicate pileus.

Marasmius excentricus, *Massee* (*sp. nov.*). *Pileus* membranaceus, excentricus, convexo-campanulatus, plus minus umbilicatus, sulcatus, albus, margine sæpe crispatus, 3–5 cm. diam. *Lamellæ* valde distantes, ventricosæ, adnatæ, albidæ, acie integra. *Sporæ* ellipticæ, hyalinæ, glabræ, 7 × 5 μ. *Stipes* excentricus, albidus, basi lutescens, 1·5–2 cm. longus, 3 mm. crassus.

PERAK. Gregarious, growing on dead wood, *Ridley*, 18.

Whole fungus tough and elastic. Allied in many respects to *M. Hookeri*, Berk., but distinguished by the short, excentric stem.

Marasmius Rotula, *Fries*, *Epicr.* (1836) p. 385.
SELANGOR. On dead and fallen branches, *Ridley*, 74.

Marasmius epochnous, *Berk. & Curt. in Journ. Linn. Soc.* (*Bot.*) xiv. (1875) p. 41.

SELANGOR. On dead bark and wood, *Ridley*, 78.

Lentinus sericeus, *Massee* (*sp. nov.*). *Pileus* membranaceus, lentus, sericeus, nitens, cinereus, zonis fuscis evanidis præditus, dein fulvescens, margine pallidior interdum fimbriatus, 2–3 cm. diam. *Lamellæ* rigidæ, subconfertæ, brunneolæ, acie lacerato-dentatata. *Sporæ* hyalinæ, glabræ, subglobosæ, 5–6 μ diam.

Selangor. On rotten wood, *Ridley*, 33.

The substance of the pileus is much thinner, more silky, and more shining than in *L. tricolor*, Berk., to which the present species is allied.

Schizophyllum flabellare, *Fries*, *Epicr.* (1838) p. 403.
Selangor. On rotten wood, *Ridley*, 90.

Claudopus griseus, *Massee* (*sp. nov.*). *Pileus* sessilis, carnoso-lentus, conchiformis ovatusve, interdum uno latere productus, griseus, sæpe corrugatus, 3–5 cm. diam. *Lamellæ* angustæ, distantes, venoso-connexæ, griseæ. *Sporæ* ellipsoideæ, asperulæ, albæ, roseo tinctæ, 8 × 5 μ. *Cistidia* numerosa, fusoidea, apice fuscidulo-granulata, 65–70 × 14–15 μ.

Perak. On dead wood, *Ridley*, 11.

Superficially closely resembling *C. byssisedus*, Pers., but differing in the elliptic spores, and numerous cistidia.

Inocybe violacea, *Massee* (*sp. nov.*). *Pileus* carnosus, primo campanulatus, dein expansus et late umbonatus, squamulosus, margine fimbriato-villosus, violaceus, versus marginem pallidior, 1 cm. diam. *Lamellæ* confertæ, augustæ, postice sinuato-adnatæ, acie fimbriata, ex albido carneove roseo-tinctæ. *Sporæ* ellipticæ, glabræ, 7 × 4 μ, ochraceæ. *Cistidia* fusoidea. *Stipes* solidus, æqualis, subfibrillosus, carneo-roseus, apice albus furfuraceusque, 2–3 cm. longus, 2 mm. crassus.

Perak. On lawns, *Ridley*, 2.

A pretty little species, allied to *Inocybe incarnata*, Bres.

Bolbitius longipes, *Massee* (*sp. nov.*). *Pileus* membranaceus, e conico-campanulato subexpansus, umbone leve prominente præditus, margine integer, glaber, læte brunneus vel luteo-fuscus, 1·5 cm. diam. *Lamellæ* subconfertæ, angustæ, postice uncinato-annexæ, aurantio-brunneæ. *Sporæ* oblongo-ovatæ, flavo-ferrugineæ glabræ, 17–18 × 11–12 μ. *Stipes* cavus, albus, glaber, æqualis, 7–8 cm. longus, 1·5–2 mm. crassus.

Selangor. On the ground, *Ridley*, 124.

Allied to *B. titubans*, Berk. Readily distinguished from every known species of *Bolbitius* by the even, acutely umbonate pileus, and slender, elongated stem.

Flammula ornata, *Massee* (*sp. nov.*). *Pileus* convexo-explanatus, umbonatus, flavus, squamulis secedentibus purpureis præditus, ætate glabrescens, 2–3 cm. diam. *Lamellæ* subconfertæ, postice sinuato-annexæ, flavæ, demum ferrugineo-maculatæ. *Sporæ* subglobosæ, intus minute granulosæ et 2–3 guttulis majoribus præditæ, 7 × 6 μ. *Stipes* solidus, glaber, basi attenuatus, 3 cm. longus, 4–5 mm. crassus.

Selangor. On the ground, *Ridley*, 23.

Not closely allied to any terrestrial species of *Flammula*. Distinguished by the purple squamules on the pileus.

Crepidotus Ridleyi, *Massee* (*sp. nov.*). *Pileus* submembranaceus, dimidiatus, reniformis, margine interdum lobatus, albidus, glaber, 4–7 mm. latus. *Lamellæ* ventricosæ, subconfertæ, brunneæ, acie integra. *Stipes* rudimentarius, albus. *Sporæ* ovato-oblongæ, glabræ, ochraceo-brunneæ, 5 × 3–4 μ.

SELANGOR. On a dead fern-rhachis, *Ridley*, 110.
Gregarious. Allied to *C. turbidulus*, Berk.

Psathyra cyclospora, *Massee* (*sp. nov.*). *Pileus* carnosulus, griseus, inexpansus conico-campanulatus, expansus subgibbosus, primo levis pruina albida conspersus, mox glabrescens, et dein margine pellucido striatus, 1·5–2 cm. diam. *Lamellæ* subconfertæ, ventricosæ, postice annexæ, pileo concolores, dein nigro-maculatæ. *Sporæ* nigro-fuscæ, subglobosæ, utrinque apiculatæ, glabræ, 12–14 μ. *Stipes* æqualis, fistulosus, glaber, albus, basi albo-fibrillosus, 4–5 cm. longus, 3 mm. crassus.
PERAK. On rotten wood, *Ridley*, 7.
Allied to *Psathyra semivestita*, Berk. & Broome.

Psathyra campanulata, *Massee* (*sp. nov.*). *Pileus* submembranaceus, campanulato-expansus, flavo-brunneus, disco brunneus, glaber, striatus, 2–3·5 cm. diam. *Lamellæ* confertæ, angustæ, postice attenuato-annexæ, e carneo-purpureo fuscescentes, acie integra. *Sporæ* ellipticæ, glabræ, carneo-fuscæ, 6–7 × 4 μ. *Stipes* fistulosus, sursum subattenuatus, albus, glaber, basi albo-tomentosus, 6–8 cm. longus, 4–5 mm. crassus.
SELANGOR. On the ground, *Ridley*, 108.
Gregarious. Allied to *P. conopilea*, Fries, but distinguished by the striate pileus and smaller spores.

Psathyrella albida, *Massee* (*sp. nov.*). *Pileus* membranaceus, digitaliformis, obtusus, striatus, glaber, albidus, 5–8 mm. latus. *Lamellæ* confertæ, postice uncinis decurrentes, incarnatæ, augustæ. *Sporæ* ellipsoideæ, pallide brunneæ, glabræ, 8 × 5 μ. *Stipes* fistulosus, hyalino-pellucidus, basi radicato-strigosus, 1·5 cm. longus, 1 mm. crassus.
SELANGOR. On rotten wood, *Ridley*, 55.
Growing in dense clusters. Allied to *P. disseminata*, Pers.

Coprinus coffeicola, *Massee* (*sp. nov.*). *Pileus* tenerrimus, campanulato-explanatus, griseus, immaturus furfuraceus, dein expansus subnudus, in rimas subfurcatas fissus, disco lividus subdepressus, 6–9 mm. diam. *Lamellæ* lineares, subconfertæ, a stipite remotæ, nigro-maculatæ, acie albida. *Sporæ* ellipsoideæ, nigro-brunneæ, glabræ, 8 × 5 μ. *Cistidea* fusoidea. *Stipes* filiformis, vix 1 mm. crassus, glaber, albidus, 3-4 cm. longus.
SELANGOR. On coffee pulp, *Ridley*, 67.
Numerous subglobose yellowish sclerotia, about 3 mm. in diameter, are present on the matrix, and these in all probability belong to the fungus ; but as the organic union between the two was not observed, this is not quite certain. Allied to *C. plicatilis*, Fries ; differing in the smaller spores and more furfuraceous pileus.

Coprinus leviceps, *Massee* (*sp. nov.*). *Pileus* membranaceus, levis, glaber, convexo-campanulatus dein explanatus, umbilicatus, cinereus, 1·5–2·5 cm. diam. *Lamellæ* confertæ, augustissimæ, postice rotundato-liberæ. *Sporæ* globosæ, atro-brunneæ, glabræ, 7–8 μ diam. *Cistidia* non visa. *Stipes* fistulosus, albus, glaber, 3–4 cm. longus, 3 mm. crassus.
PERAK. Densely gregarious on a dead stump of *Areca*, *Ridley*, 17.

Allied to *C. deliquescens*, Bull., but readily distinguished from this and every other known species of *Coprinus* by the perfectly even pileus and globose spores.

Lenzites platyphylla, *Lév. in Ann. Sci. Nat.*, sér. 3, ii. (1844) p. 173.
SELANGOR. On dead wood, *Ridley*, 91.

Polyporus albellus, *Massee* (*sp. nov.*). *Pileus* dimidiatus, semi-orbicularis seu reniformis, tenuis, applanatus, glaber, margine expanso interdum lobatus, albidus, 4-5 cm. diam. *Pori* ampli, oblongi aut angulati, stramineo-albi, postice decurrentes. *Stipes* lateralis, brevis, subæqualis, concolor, 1 cm. longus.
SELANGOR. On dead wood, *Ridley*, 80.
Allied to *P. Gunnii*, Berk.

Polyporus arcularius, *Fries*, *Syst. Myc.*, i. (1821) p. 342.
SELANGOR. On rotten wood, *Ridley*, 31.

Polystictus membranaceus, *Sacc.*, *Syll.*, vi. (1888) no. 287.
SELANGOR. On dead wood, *Ridley*, 92.

Polystictus latus, *Sacc.*, *Syll.*, vi. (1888) no. 291.
SELANGOR. On rotten wood, *Ridley*, 93.

Polystictus licmophorus, *Massee* (*sp. nov.*). *Pileus* coriaceo-membranaceus, convexo-applanatus, levis vel leviter lineis concentricis zonatus, semi-orbicularis, attenuato-substipitatus, minutissime velutino-villosus, dein glaber, e cinnamomeo pallidus, 1·5–2 cm. diam. *Pori* minutissimi, subrotundi, albi, vel in ætate vel triti lividi. *Sporæ* hyalinæ, ellipsoideæ, 6 × 3 μ.
SINGAPORE. On rotton wood, Botanic Gardens, *Ridley*, 55.
Allied to *P. squamiformis*, Berk., but differing in the smaller spores and paler colour of the pileus.

Hydnum crinigerum, *Massee* (*sp. nov.*). *Subiculus* resupinatus, tenuis, ochraceus, albo-flocculosus, 1–2 cm. latus. *Aculei* cylindraceo-filiformes, elongati, acutiusculi, pallide sulphurei, exsiccati albidi. *Sporæ* subglobosæ, verruculosæ, hyalinæ, 5–6 μ diam.
SELANGOR. On dead bark, *Ridley*, 107.
Forming scattered patches; the spines up to 6 mm. long, slender and hair-like, but not crowded.

Hydnum tapienum, *Massee* (*sp. nov.*). *Pileus* sessilis, imbricatus, carnosus, lentus, siccatate rigidus margine forte involutus, subreniformis vel flabelliformis, virgatus, 5–8 cm. diam. *Aculei* conferti, acutiusculi, glabri vel minutissime asperuli, pallide ochracei, circa 3 mm. longi. *Sporæ* globosæ, hyalinæ, glabræ, 5–6 μ diam.
SELANGOR. On fallen trunks, *Ridley*, 75.
Allied to *H. flavum*, Berk.

Stereum aterrimum, *Massee* (*sp. nov.*). *Pileoli* vel simplices vel 2–4 lateraliter connati et imbricatim dispositi, puncta laterali affixi, 3–5 cm. circiter diam., conchiformes, superne radiato-rugosi, rigidissimi, fuligineo-rufescentes, dein nigricantes. *Hymenium* scabriusculum, nigrum, rimosum. *Sporæ* oblongo-ellipticæ, hyalinæ, 7 × 4 μ.

SINGAPORE. On dead wood, Botanic Gardens, *Ridley*, 48.

Readily distinguished by its extreme rigidity, and by the black colour of every part.

Cladoderris cartilaginea, *Massee* (*sp. nov.*). *Pileus* coriaceo-lentus, erectus, flabelliformis vel obovatus, margine repandus vel lobatus, levis, glaber, fusco-brunneus, expallens, 5–8 cm. altus, 3–5 cm. latus. Hymenium glabrum, longitudinaliter radiato-rugosum, concolor. *Sporæ* ellipsoideæ, hyalinæ, basi oblique apiculatæ, $10 \times 5 - 5{\cdot}5\ \mu$.

SINGAPORE. On decayed wood, buried in the ground, Botanic Gardens, *Ridley*, 47.

Distinguished by the thin substance of the pileus, which is cartilaginous when dry.

Clavaria Ridleyi, *Massee* (*sp. nov.*). *Caulis* crassus, brevis, 1 cm. circiter diam., umbrinus, solidus ; rami subconferti, teretes, leves, dichotomo-ramulosi, umbrino-rufescentes, apicibus lunulato-furcatis. *Caro* alba. *Sporæ* hyalinæ, subglobosæ, glabræ, $7 \times 8\ \mu$; basidia clavata, $35 \times 12\ \mu$.

PERAK. On the ground at the base of trunks, *Ridley*, 19.

A very marked species, characterised by the short, stout trunk, and umber colour.

Clavaria Candelabra, *Massee* (*sp. nov.*). *Caulis* tenuis, 1–2 cm. longus, 2 mm. crassus, basi albo-villosus ; rami 2–4, ramulos rare gerentes ; ramuli ultimi inæquales, fere verticillati, vix vel haud caule tenuiores, in sicco sulcato-rugosi ; rami ramulique juniores pallide lutei, dein flavo-rufescentes. *Sporæ* hyalinæ, glabræ, subglobosæ, $4\text{–}5{\cdot}5\ \mu$, diam.

SELANGOR. On rotten wood, *Ridley*, 37.

Allied to *C. epichnoa*, Fries.

Favolus scaber, *Berk. et Broome in Journ. Linn. Soc.*, xiv. (1875) p. 57.

SELANGOR. On dead wood, *Ridley*, 30.

Laschia cæspitosa, Sacc., Syll. vi. (1888) no. 407.

SELANGOR. On dead wood, *Ridley*, 32.

Tremellodon aurantiacum, *Massee* (*sp. nov.*). *Pileus* gelatinoso-cartilagineus, flabelliformis, longe stipitatus, aurantiacus, 1–2 cm. latus. *Aculei* minuti, subulati, acutissimi. *Sporæ* subglobosæ, hyalinæ, 6–7 μ diam.

SELANGOR. On rotten wood, *Ridley*, 72.

Differs from all known species in the bright orange colour of every part. It bears a very close superficial resemblance to *Guepinia spathularia*, Fries. The spines on the hymenium are very minute, and almost inconspicuous when dry.

Tremella picea, *Massee* (*sp. nov.*). *Hymenophora* cartilagineo-gelatinosa, corrugata, sessilia, brunneo-nigra, 3–4 cm. lata. *Basidia* obovata, cruciatim partita. *Sporæ* hyalinæ, ellipsoideæ, leviter curvatæ, $11\text{–}12 \times 3\text{–}4\ \mu$.

SELANGOR. On dead wood, *Ridley*, 27.

Allied to *T. corrugata*, Schweinitz ; differing in the absence of a purple tinge, and in not becoming squamulose when dry.

Hirneola porphyrea, *Fries, Fung. Natal.* (1848) p. 27.
SELANGOR. On rotten wood, *Ridley*, 20.

Geaster Maurus, *Massee* (*sp. nov.*). *Peridium* globosum, umbonatum, umbrinum, stratis duobus distinctis compositum, exteriore rigido carnoso stellatim laciniato, interiore globoso-depresso papyraceo ; ostiolum fimbriatum. *Gleba* aterrima, columella evanescente. *Sporæ* globosæ, nigro-fuscæ, echinulatæ, 3 μ diam.
SINGAPORE. On the ground, *Ridley*, 30.
Characterised by the black gleba.

Tulostoma Ridleyi, *Massee* (*sp. nov.*). *Peridium* stipitatum, depresso-globosum, verrucis pyramidalibus brunneis exasperatum, 1·5–2 cm. latum ; os ad apicem mammæ positum, mox lacerato-evanescens. *Stipes* cavus, æqualis, basi bulbosus, bulbo apice marginato, squamulosus, dein glabrescens, 3 cm. longus 4 mm. crassus. *Gleba* læte ochracea. *Sporæ* globosæ, flavidæ, asperulæ, 6–7 μ diam.
PERAK. On the ground near stumps, *Ridley*, 8.
Allied to *T. exasperatum*, Mont.

ASCOMYCETES.

Cordyceps Ridleyi, *Massee* (*sp. nov.*). *Stroma* erectum, cylindricum, 3–4 mm. altum, in stipitem filiformem deorsum abrupte attenuatum, supra in stylum longiusculum productum, griseo-brunneum, scabriusculum. *Perithecia* immersa, ovoidea, 250 μ diam., ostiolo papillato ornata. *Asci* cylindrici, stipitati, apice capitati, 150 × 7 μ. *Sporæ* octonæ, filiformes, basi et apice acutiusculæ, primo dense guttulatæ, dein pluri-septatæ, 110 × 1·5 μ.
SELANGOR. On an ant, *Ridley*, 89.
Springing in considerable numbers from the head, thorax, abdomen, and limbs, and some imperfect stromata also occur on the antennæ. Allied to *C. stylophora*, Berk. & Broome.

Cordyceps lignicola, *Massee* (*sp. nov.*). *Capitulum* cylindraceo-clavatum, obtusum, durum, nigrum, 2–3 cm. longum, 3 mm. latum. in stipitem cylindricum æquilongum nigrum deorsum abrupte attenuatum. *Perithecia* ovata, immersa, ostiolis minutissimis prominulis. *Asci* cylindracei, longissimi, octospori. *Sporæ* aciculares, hyalinæ, multiseptatæ, 180 × 2 μ.
SELANGOR. On rotten wood, *Ridley*, 41.
A very interesting form, the only known species of *Cordyceps* growing on wood, the others being either entomogenous or mycogenous : stem slender, glabrous, longer than the fertile portion.

Hypocrella scutata, *Sacc. in Michelia* i. (1879) p. 580.
PERAK. On living leaves of an undetermined tree, *Ridley*, 16.
The species was founded on specimens from Singapore growing on the living leaves of *Myristica* sp.

Hypocrella Panici, *Massee* (*sp. nov.*). *Stroma* carnosulum, elongatum, nigrum. *Perithecia* ovoidea, in stromate immersa,

ostiolo papillato. *Asci* cylindraceo-clavati, longe stipitati, 150 × 6 μ, octospori. *Sporæ* filiformes, hyalinæ, multiseptatæ, 100 × 1·5 μ.

SELANGOR. Distorting the lateral branches of a species of *Panicum*, *Ridley*, 88.

The stroma is 2–3 cm. long, curved, half encircling the branch. Allied to *H. semiamplexa*, Sacc.

Hypocrella Zingiberis, *Massee* (*sp. nov.*). *Stroma* carnosum, pulvinatum, aurantiacum dein pallescens, 3–4 mm. diam. *Perithecia* stromate immersa. *Asci* anguste cylindraceo-clavati, 140–150 × 8 μ, octospori. *Sporæ* filiformes, ascis subæquales, multiseptatæ, 120 × 1·5 μ.

PERAK. On petioles of a *Zingiber*, *Ridley*, 10.

Allied to *H. Bambusæ*, Sacc.; differing in the longer spores and the bright orange-coloured stroma.

Xylaria hypsipoda, *Massee* (*sp. nov.*). *Stroma* globosum, nigrum, intus suberosum, pallidum, stipitatum, 3–5 mm. diam. *Stipes* simplex, filiformis, rectus vel subflexuosus, sursum patenti-hirsutus, 6–8 cm. longus, 1 mm. crassus. *Asci* elongato-clavati, octospori. *Sporæ* 1-seriatæ, ellipsoideæ, basi et apice subacutæ, brunneæ, 12 × 6–7 μ.

SINGAPORE. Gregarious on dead leaves, Bukit Manda, *Ridley*, 34.

Xylaria aspera, *Massee* (*sp. nov.*). *Capitulum* clavatum vel obovatum, obtusum, nigrum, asperatum, 1–1·5 cm. altum, in stipitem curtum deorsum attenuatum. *Perithecia* peripherica, immersa, globosa, ostiolis minutis exsertis. *Asci* cylindracei, substipitati, 125 × 7 μ. *Sporæ* octonæ, oblique monostichæ, ellipticæ, cymbiformes, nigræ, 10 × 5 μ.

SELANGOR. On rotten wood, *Ridley*, 71.

Clubs sometimes deformed; distinguished by the corrugated surface and the small spores.

Xylaria acicularis, *Cooke in Grevillea* xi. (1883) p. 85.
SELANGOR. On dead wood, *Ridley*, 63.

Xylaria ianthino-velutina, *Mont.*, *Syll. Crypt.* (1856) no. 690.
PERAK. On rotten wood, Larut, *King*, 2252.
Hitherto only recorded from South America.

Diatrype excitans, *Cooke in Ann. N. York Acad.* i. (1878) p. 185.
SELANGOR. On dead wood, *Ridley*, 44.

Peziza radiculosa, *Berk. & Broome in Journ. Linn. Soc.* (*Bot.*) xiv. (1875) p. 103.

PERAK. On the ground, *Ridley*, 12.

A very fine and distinct species, only previously recorded from Ceylon.

Peziza tricholoma, *Mont. in Ann. Sci. Nat.* ii. (1834) 77, t. 4, fig. 2.

SELANGOR. On dead wood, *Ridley*, 36.

When quite young the outside and margin bristles with long spine-like hairs, each composed of a fascicle of hyphæ. As the plant becomes mature, the majority of these hairs fall away, and in old specimens the surface is often quite glabrous. The asci are remarkable for being abruptly narrowed at the base into a long, very slender pedicel. *P. Hindsii*, Berk., is in every respect identical with the present species.

Peziza martialis, *Massee (sp. nov.)*. *Ascomata* gregaria, subsessilia, convexa dein applanata, 2·5–3·5 cm. lata, extus puberula pallida, disco obscure coccinea. *Asci* cylindrici, deorsum in stipitem elongatum attenuati, 375–380 × 20–22 μ, octospori. *Sporæ* ellipticæ, hyalinæ, glabræ, oblique monostichæ, 30 × 18 μ. *Paraphyses* filiformes, apice clavatæ, septatæ.

SELANGOR. On the ground, *Ridley*, 48.

Distinguished amongst the crimson species of *Peziza* by the large size of the asci and spores. Hypothecium and excipulum composed of slender interwoven hyphæ. Asci not tinged blue by iodine.

Peziza tomentosa, *Massee (sp. nov.)*. *Ascomata* sessilia, convexa dein explanata, subcarnosa, extus albo-tomentosa, disco flavida, 1–1·5 cm. lata. *Asci* cylindracei, obtusati, deorsum in stipitem obliquum attenuati, iodo non tincti, ostospori, 150–160 × 13–14 μ. *Sporæ* ellipticæ, utrinque subacutæ, hyalinæ, glabræ, 15–16 × 10 μ. *Paraphyses* filiformes, septatæ, apice subclavatæ.

SELANGOR. On the ground, *Ridley*, 70.

Allied to *P. fibrillosa*, Curr.

Mollisia cinnabarina, *Massee (sp. nov.)*. *Ascomata* sessilia, subcarnosa, concavo-explanata, extus puberula dein glabra, rugulosa, extus pallide rosea, disco cinnabarina, marginibus elevatis tumidis, 5–8 mm. lata. *Asci* cylindracei, obtusati, iodo haud tincti, octospori, 160 × 11 μ. *Sporæ* ellipticæ, utrinque obtusæ, hyalinæ, glabræ, obliquæ, monostichæ, 18 × 9–10 μ. *Paraphyses* numerosæ, guttulatæ, æquales, 3 μ diam.

SELANGOR. On dead branches, *Ridley*, 95.

Allied to *M. albo-flava*, Massee, while resembling *Geopyxis coccinea* in colour.

Mollisia albo-flava, *Massee (sp. nov.)*. *Ascomata* sessilia, carnosa, explanato-concava, glabra, extus albida, margine sæpissime undulato-repando pallida, disco citrina, 4–7 mm. lata. *Asci* cylindraceo-fusoidei, obtusi, iodo hand tincti, 100–120 × 9–10 μ, octospori. *Sporæ* hyalinæ, ellipsoideæ, 9 × 6 μ. *Paraphyses* numerosæ, apice subincrassatæ, filiformes.

SELANGOR. On a dead branch, *Ridley*, 62.

Scattered or gregarious ; allied to *M. personata*, Sacc.

Mollisia rosea, *Massee (sp. nov.)* *Ascomata* carnosa, ex hemispherico expansa, sessilia vel subradicato-producta, extus leviter tomentosa, albida, 5–10 mm. lata, disco e pulchre roseo depallente. *Asci* cylindracei, iodo hand tincti, basi non vel vix attenuati, 120 × 12 μ. *Sporæ* ellipticæ, utrinque obtusatæ, hyalinæ, glabræ, biguttulatæ, 14 × 8 μ.

SELANGOR. On dead branches, *Ridley*, 82.

Readily distinguished amongst the known species by the clear, rose-coloured disc. Allied to the species above, *M. albo-flava*, Massee.

Trichopeziza chrysotricha, *Sacc.*, *Syll.* viii. (1889) p. 411.
SELANGOR. On rotten twigs, *Ridley*, 47.

HYPHOMYCETES.

Isaria Sphingum, *Schweinitz*, *Syn. Fung. Car.* (1822) p. 126.
SELANGOR. Parasitic on a green elephant hawk-moth, *Ridley*, 59.

PHILIPPINE ISLANDS.

BASIDIOMYCETES.

Lenzites applanata, *Fries*, *Epicr.* (1836) p. 644.
LUZON, Manilla. On dead wood, *Loher*.

Fomes Senex, *Sacc.*, *Syll.* vi. (1888) p. 164.
LUZON. On dead wood, Loher.

Polystictus sanguineus, *Fries in Nov. Act. Soc. Sc. Upsal.* i. (1851) p. 74.
LUZON. On rotten wood, *Loher*.

Polystictus Xanthopus, *Fries in Nov. Act. Soc. Sc. Upsal.* i. (1851) p. 74.
LUZON. On rotten wood, *Loher*.

Hexagonia apiaria, *Pers. in Freyc.*, *Voy.* (1826) p. 160, t. 2, fig. 5.
LUZON. Manilla. On dead wood, Loher.

Hexagonia rigida, *Berk. in Journ. Linn. Soc.* (*Bot.*) xvi. (1878) p. 54.
LUZON. Manila. On rotten wood, *Loher*.

Favolus purpureus, *Massee* (*sp. nov.*). *Pileus* carnosus, e campanulato expansus, orbicularis, ex involuto expansus, interdum margine undulatus, purpureus, glaber, 1–2 cm. latus. *Alveoli* e rotundato subhexagoni, radiatim elongati, majusculi, purpurei, in sicco fulvescentes. *Stipes* centralis, sursum attenuatus, glaber, purpureus, basi fuscescens, 3–4 cm. longus. *Caro* flavida. *Sporæ* hyalinæ, elongatæ, glabræ, biguttulatæ, $8 \times 4\ \mu$.
LUZON. On the ground, *Loher*.
Gregarious. Recognised by the purple colour of every part.

USTILAGINEÆ.

Ustilago virens, *Cooke in Grevillea* vii. (1878) p. 15.
LUZON. Manila. In ovaries of *Oryza sativa*, Linn., *Loher*.

HYPHOMYCETES.

Isaria Sphingum, *Schweinitz*, *Syn. Fung. Car.* (1822) p. 126.
LUZON. Manila. On undetermined larvæ, *Loher*.

British New Guinea.

Ascomycetes.

Phyllachora ulcerata, *Massee* (*sp. nov.*) *Stroma* superficiali-prominens, tuberculiforme, e loculis mammillatum, atrum, 3–5 mm. latum. *Loculi* ovati, minuti, in stromate nidulantes. *Asci* cylindraceo-pedicellati, 65–70 × 10 μ, octospori. *Sporæ* distichæ, hyalinæ, ovato-oblongæ, glabræ, 10–12 × 5 μ. *Paraphyses* ramosæ, filiformes.

On the upper surface of a coriaceous leaf, *Bailey*.

Allied to *P. incarcerata*, Sacc.

Aulographum maximum, *Massee* (*sp. nov.*) *Perithecia* gregaria, lineari-elongata, nigra, rima augustissima dehiscentia. *Asci* cylindraceo-clavati, aparaphysati, octospori, 90–100 × 12–14 μ. *Sporæ* hyalinæ, allantoideæ, curvulæ, circa apicem 1–septatæ, 17–18 × 5–6 μ.

On culms of *Imperata arundinacea*, Cyr., *Bailey*.

Allied to *A. culmigenum*, Sacc., but distinguished by the much larger perithecia and spores.

Queensland.

Ascomycetes.

Phyllosticta flavidula, *Sacc. in Michelia*, i. (1879) p. 521.
Brisbane. On living leaves of a *Callistemon*, *Bailey*, 1115.

Stigmatea seminata, *Sacc.*, *Syll.*, i. (1882) no. 543.
Brisbane. On the pods of *Desmodium parvifolium*, DC., *Bailey*, 1117.

Sphæropsideæ.

Glœosporium kurzeanum, *Niessl in Rabenh. Fung. Eur. Exsicc.*, no. 2471.
Brisbane. On living leaves of *Lathyrus latifolius*, Linn., *Bailey*, 1118.

Tasmania.

Basidiomycetes.

Clitocybe Tuba, *Fries*, *Epicr.* (1836) p. 72.
Rodway, 293.

Collybia Eucalypti, *Massee* (*sp. nov.*). *Pileus* carnosus, tenuis, e convexo explanatus, interdum subumbonatus, margine imprimis incurvus, levis, glaber, eburneus, disco griseo-tinctus, 2–3 cm.

latus. *Lamellæ* annexæ, demum liberæ, confertæ, albidæ, acie serrulata. *Stipes* fistulosus, sursum attenuatus, incurvatus, fibrosus, pallide brunneus, 4–6 cm. longus. *Sporæ* hyalinæ, obovatæ, 5–6 × 3–4 μ.

On a *Eucalyptus* trunk, *Rodway*, 73.

Clustered, tough. In old, large specimens the whole surface of pileus and stem is marbled with glands or exudations, but not so in other cases. (*Rodway*).

Hygrophorus Rodwayi, *Massee* (*sp. nov.*). *Pileus* carnosus, e convexo plano-umbonatus, vel gibbosus, viscidulus, albellus, vel cremoricolor, glaber, 4–5 cm. latus. *Lamellæ* distantes, ad latera venosæ, longe decurrentes, ex albido pileo concolores. *Stipes* solidus, sursum incrassatus, concolor, subfibrilloso-glabrescens, 5 cm. longus, apice 7–10 mm. crassus. *Sporæ* subglobosæ, rugulosæ, apiculatæ, hyalinæ, 7–8 μ diam.

On the ground, *Rodway*, 137.

Allied to *H. eburneus*, Bull., but differing in the structure of the stem.

Xerotus atrovirens, *Massee* (*sp. nov.*). *Pileus* membranaceus, resupinatus, pruinosus, atro-virens, 5 mm. latus. *Lamellæ* angustæ, anastomosantes, pileo concolores, acie pallida. *Sporæ* hyalinæ, globosæ, 4 μ diam. *Stipes* excentricus, incurvus, pruinosus, 2–3 mm. longus.

On dead twigs of a *Billardiera*, *Rodway*, 610.

Allied to *X. Berterii*, Mont., but distinguished by the blackish green tinge of every part.

Pluteus phæus, *Massee* (*sp. nov.*). *Pileus* tenuis, e convexo expansus, obtuse umbonatus, glaber, atro-cyaneus, 2–4 cm. latus. *Lamellæ* confertæ, postice rotundato-liberæ, e cæsio incarnato-griseæ. *Sporæ* angulatæ, 8–10 μ diam. *Stipes* farctus, flexuosus, superne subdilatatus, chalybeus, basi excepta glaber, 5–6 cm. longus, 2–3 mm. crassus.

On dead wood, *Rodway*, 562.

Resembling *Leptonia bizzozeriana*, Sacc., which differs from the present in the scurfy pileus and elliptic spores.

Leptonia obscura, *Massee* (*sp. nov.*). *Pileus* carnosulus, e convexo plano-umbonatus, margine primo involutus, nigro-chalybeus, junior totus dense villosus, dein bene evolutus squamulis parvulis obsitus, 2–4 cm. latus. *Lamellæ* subconfertæ, latæ, adnatæ, fuliginosæ, demum carneo tinctæ. *Sporæ* angulosæ, apiculatæ, 9–10 μ diam. *Stipes* farctus, æqualis, concolor, 5–6 cm. longus, 3 mm. crassus.

On the ground in woods, *Rodway*, 307.

Affinity with *L. chalybea*, Fries.

Flammula Aldridgei, *Massee in Grevillea*, xx. (1891) p. 25.

Rodway, 45.

This species was incorrectly referred to *Flammula veluticeps*, Cooke and Mass., by McAlpine.

Psilocybe œdipus, *Massee* (*sp. nov.*). *Pileus* carnosus, e convexo plano-depressus, margine levis, glaber, siccus, obscure rufo-brunneus, 3–5 cm. latus. *Lamellæ* confertæ, postice ventricosæ,

e flavo-brunneo fuscescentes. *Sporæ* ellipsoideæ, fuligineæ, 6–7 × 4 μ. *Stipes* fistulosus, æqualis, basi bulbosus, lamellis concolor, 4–5 cm. longus.

On the ground, Hobart, *Rodway*, 320.

Allied to *P. sarcocephala*, Fries.

Boletus Rodwayi, *Massee* (*sp. nov.*). *Pileus* pulvinatus, dein convexo-planus, viscosus, glaber, vinosus, margine flavescens, 3–5 cm. latus. *Caro* alba, sapore grato. *Tubuli* circa stipitem depressi, elongati; pori angulati, ·05 mm. lati, incarnati vel subrubentes. *Sporæ* cylindrico-fusoideæ, uniguttulatæ, rubro-brunnescentes, 9–10 × 4 μ. *Stipes* solidus, subæqualis, albidus, basi attenuatus, curvatus vel subflexuosus, 7–8 cm. longus, 1–1·5 cm. crassus.

On the ground, *Rodway*, 266, with a figure.

Distinguished amongst species having flesh-coloured tubes by the viscid pileus and somewhat slender, equal, incurved stem. Flesh of pileus comparatively thin.

Polyporus lacteus, *Fries*, *Syst. Myc.*, i. (1821) p. 59.
On wood, *Rodway*, 194.

Polyporus tasmanicus, *Massee* (*sp. nov.*). *Pileus* carnosus, turbinatus, plano-depressus, ochroleucus vel pallide alutaceus, glaber, 6–7 cm. latus. *Pori* breves, inæquales, subrhomboidei, straminei, marginibus fimbriati, circa 1 mm. lati. *Caro* alba, lenta. *Sporæ* hyalinæ, leves, oblongo-ellipsoideæ, 10–13 × 6–7 μ. *Stipes* centralis, solidus, subreticulatus, 2–2·5 × 1·5 cm.

On the ground, *Rodway*, 138.

Nearest affinity with *P. ovinus*, Fries.

Hydnum Caput-medusæ, *Fries*, *Syst. Myc.* i. (1821) p. 409.

On dead wood, *Rodway*, 234.

A small form, 2–3 cm. in diameter, and in this respect differing from the typical European form, with which it, however, agrees in all essential features.

Hymenochæte Mougeotii, *Massee in Journ. Linn. Soc.* (*Bot.*) xxvii. (1891) p. 111.

On dead bark, *Rodway*, 448.

Hymenochæte corrugata, *Lév. in Ann. Sci. Nat.* sér. 2, v. (1846) p. 152.

On dead wood, *Rodway*, 337.

Hymenochæte tenuissima, *Berk. in Journ. Linn. Soc.* (*Bot.*) x. (1869) p. 333.

On dead wood, *Rodway*, 336.

Peniophora Berkeleyi, *Cooke in Grevillea*, viii. (1879) p. 20.
On dead bark, *Rodway*, 542.

Myxomycidium, *Massee* (*nov. gen.*). *Receptacula* pendula, stipitata, tremelloso-gelatinosa, hyalina. *Basidia* clavata, sterigmatibus quaternis. *Sporæ* continuæ, hyalinæ.

A remarkable genus without very evident affinities. The watery, gelatinous substance suggests the Tremellineæ, but the narrowly clavate basidia, surmounted by four slender sterigmata,

are opposed to this view. The general form of the sporophore is that of the Clavarieæ, where the gelatinous consistency is unknown.

Myxomycidium pendulum, *Massee* (sp. nov.). *Receptacula* pendula, aquoso-gelatinosa, stipitata, lanceolata, apice acuta, hyalina vel basi ochraceo tincta, 1–1·5 cm. longa. *Basidia* clavata, 25–28 × 6–7 μ. *Sporæ* ovatæ, inæquilaterales, hyalinæ, glabræ, 8–9 × 6 μ.

On rotten wood, *Rodway*, 605.

"Always pendulous and in consistency much more watery than any *Clavaria* we have." (*Rodway*.)

Solenia candida, *Pers.*, *Disp.* (1797), p. 6.

On rotten wood, *Rodway*, 587.

In some parts of the specimen the plants are closely compacted laterally, and indistinguishable from *Poria*.

Kneiffia Wrightii, *Berk. & Curt.* in *Journ. Linn. Soc.* (*Bot.*) x. (1869) p. 327.

On dead wood, *Rodway*, 468.

Tremella vinosa, *Massee* (sp. nov.). *Receptaculum* gelatinosum, molle, gyroso-plicatum, glabrum, vinosum, 1–2 cm. latum. *Basidia* globosa, 4-sterigmatica. *Sporæ* subglobosæ, hyalinæ, glabræ, 10 μ.

On dead wood, *Rodway*, 594.

Allied to *T. corrugata*, Schweinitz.

Gyrocephalus luteus, *Massee* (sp. nov.). *Receptacula* gelatinosa, stipitata, spathulato-convoluta, flavida, 1–1·5 cm. lata. *Basidia* globosa, cruciatim partita, sterigmatibus quaternis elongatis coronata. *Sporæ* hyalinæ, continuæ, glabræ, oblongo-curvatæ 12–13 × 4–4·5 μ.

On dead wood, *Rodway*, 598.

Secotium Gunnii, *Berk.* in *Cooke*, *Handb. Austr. Fung.* (1892) p. 221.

On the ground, *Rodway*, 291.

Tylostoma mammosum, *Fries*, *Syst. Myc.* iii. (1829) p. 42.
On the ground, *Rodway*, 535.

Diploderma glaucum, *Cooke & Massee* in *Grevillea*, xv. (1887) p. 99.

In the ground on dry hill-sides, *Rodway*, 534.

Mr. Rodway points out that the central woody nucleus is absent in this species, which thus lacks one of the essential features of the genus *Diploderma*.

Hymenogaster nanus, *Massee et Rodway* (sp. nov.). *Peridium* globosum, gibbosum, vix viscidum, 1·5 cm. latum, griseo-brunneum, a gleba facile separabile; cellulæ e basi sterili radiantes; septa crassa, brunnea. *Sporæ* ellipticæ, utrinque subacutæ, verruculosæ, flavo-brunneæ, pellucidæ, 14–15 × 8 μ.

Underground, Hobart, *Rodway*, 609.

"I have only found the one specimen. It seems very close to forms of *Secotium Gunnii* ? but the spores are brown and twice as large." (*Rodway*).

Hysterangium neglectum, *Massee et Rodway* (*sp. nov.*). *Peridium* subglobosum, extus pallidum, rugulosum, nec a gleba separabile, 1–1·5 cm. latum. *Gleba* subgelatinosa, obscure brunnea, absque basi sterili; cellulæ irregulares, gyrosæ. *Sporæ* ellipsoideo-oblongæ, utrinque obtusæ, rugulosæ, pallide flavo-brunneæ, 12–13 × 8 μ.

Underground, Hobart, *Rodway*, 614.

Allied to *H. affine*, Massee & Rodway.

ASCOMYCETES.

Hypocrea rufa, *Fries*, *Summa Veg. Scand.* (1849) p. 383.
On rotten wood, *Rodway*, 555.

Xylaria cupressiformis, *Becc. in Erb. Critt. Ital.* no. 1278.
On dead bark, *Rodway*, 554.

Hypoxylon annulatum, *Mont.*, *Syll. Crypt.* (1856) p. 213.
On dead wood, *Rodway*, 224.

Nectria tephrothele, *Berk. in Hook. f.*, *Flor. Tasm.* ii. (1860) p. 278.

Parasitic on *Hypoxylon annulatum*, Mont., *Rodway*, 224.

Parodiella Banksiæ, *Sacc. et Bizz. in Sacc.*, *Syll.* ix. (1895), no. 1723.

On the under surface of living leaves of *Banksia marginata*, Cav., *Rodway*, 540.

Coccomyces trigonus, *Karsten.*, *Myc. Fenn.* i. (1871) p. 257.
On dead leaf of *Eucalyptus obliqua*, L'Hérit., *Rodway*, 542.

Lembosia geographica, *Massee* (*sp. nov.*). *Perithecia* dense gregaria, in maculis rotundis nigricantibus nidulantia, elongato-flexuosa, contextu parenchymatica. *Asci* subclavati, breviter pedicellati, octospori. *Sporæ* oblongæ, medio 1-septatæ, ad septum demum subconstrictæ, flavo-brunneæ, 20 × 6–7 μ.

On phyllodes of *Eucalyptus obliqua*, L'Hérit., *Rodway*, 541.

Spots black, usually circular, averaging 5 mm. across; often running into each other and forming irregular patches.

Lasiosphæria ovina, *Cesati et De Notar.*, *Schema Sfer. Ital.* (1861) p. 229.

On bark, along with *Sordaria caudata*, Sacc., *Rodway*, 584.

Sordaria caudata, *Sacc.*, *Syll.* i. (1882) no. 858.

On bark, along with *Lasiosphæria ovina*, Cesati & De Notar., *Rodway*, 584.

Dothidiella inæqualis, *Cooke in Grevillea*, xx. (1891) p. 5.
On leaves of *Eucalyptus obliqua*, L'Hérit., *Rodway*, 538.

Exoascus deformans, *Fuckel*, *Symb. Mycol.* (1869) p. 252.
On living peach leaves, *Rodway*, 455.

"Seems to differ in habit from the described plant by always growing on the upper surface of the leaf, and in the ascigerous stage being immediately followed by conidia that form a close, pale brown, velvety surface." (*Rodway*).

Barlæa miltina, *Sacc.*, *Syll.* viii. (1889) no. 424.
On sandy soil, *Rodway*, 139.

Lachnea stercorea, *Gillet*, *Disc. France* (1879), p. 76.
On cow dung, *Rodway*, 552.
The Tasmanian fungus is a trifle smaller in every part than the typical European form. The stellate hairs are well developed on the exterior of the ascophore.

Umbrophila aurantiaca, *Massee* (*sp. nov.*) *Ascomata* e subgloboso explanata, marginibus revoluto-convexis, substipitata, usque 1 cm. lata, subochracea, glabra, disco læte ochracea vel aurantiaca. *Asci* cylindracei, basi elongato-attenuati, apice iodo intense cæruleo-tincti. *Sporæ* monostichæ, hyalinæ, ellipsoideæ, plerumque biguttulatæ, 10–12 × 7–8 μ, continuæ. *Paraphyses* numerosæ, filiformes, apice vix incrassatæ, septatæ.
On trunk of *Dicksonia antarctica*, Labill., Hobart, *Rodway*, 619.
Distinguished from every known species of *Umbrophila* by the clear ochraceous colour of all parts.

SPHÆROPSIDEÆ.

Ceuthospora innumera, *Massee* (*sp. nov.*). *Stroma* pustuliforme, nigrum, pluriloculare, loculis distinctis sine ordine dispositis, ostiolis prominulis, subcutaneo-erumpens, 0·5–1 mm. latum. *Sporulæ* hyalinæ, cylindraceæ, rectæ, 25 × 2·5–3 μ.
On a dead leaf of *Eucalyptus*, Rodway, 616.
Densely crowded, usually confined to one surface of the leaf; allied to *C. Oleæ*, Kalchbr. & Cooke.

NEW ZEALAND.

SPHÆROPSIDEÆ.

Phoma Podocarpi, *Massee* (*sp. nov.*) *Perithecia* gregaria, atra, subepidermica, ostiolo suberumpentia, obtusa, contextu parenchymatica, cellulis minutissimis, 250 μ lata. *Basidia* filiformia. *Sporæ* hyalinæ, cylindrico-ellipticæ, utrinque obtusatæ, 2-guttulatæ, 9–10 × 2 μ.
On leaves of *Podocarpus ferruginea*, G. Benn., Otago, *Hector*, 80.
Allied to *P. Saxifragarum*, West.

SOLOMON ISLANDS.

ASCOMYCETES.

Aposphæria Alpiniæ, *Massee* (*sp. nov.*). Perithecia gregaria vel sparsa, subcutaneo-erumpentia, globosa-depressa, atra, papillata, ·5 mm. lata. *Basidia* filiformia, 25–30 × 1·5 μ. *Sporæ* hyalinæ continuæ, ellipsoideæ vel obovatæ, episporio glabræ, 20–23 × 10–12 μ.

In a collection chiefly from New Georgia, on the branches of the inflorescence and also on the calyx and corolla of an *Alpinia*, *Officers of H.M.S. 'Penguin*,' 1894-1895.

New Caledonia.

Sphæropsideæ.

Glœosporium Araucariæ, *Massee* (*sp. nov.*). *Acervuli* innato-erumpentes, convexuli, sparsi, pallidi, ·5–1 mm. lati, epidermide irregulariter lacerata cincti. *Basidia* filiformia, hyalina, 10–15 μ longa. *Conidia* elongato-subfusoidea, hyalina, 18–21 × 4–5 μ.

On the female cones of *Araucaria Rulei*, F. Muell., *Veitch*.

Allied to *G. Coniferum*, Sacc. & Roumeg.

Sierra Leone,

Ascomycetes.

Clypeolum sparsum, *Massee* (*sp. nov.*). *Perithecia* hinc inde in folii superficie sparsa, nec in maculis nigris insidentia, superficialia, epiphylla, glaberrima, atra, astoma, 250–300 μ diam. *Asci* cylindrici, sursum obtusissime rotundati, deorsum brevissime attenuato-stipitati, paraphysibus obvallati, octospori, 45–50 × 9–10 μ. *Sporæ* distichæ, oblongo-ellipticæ, medio 1-septatæ, non vel vix constrictæ, basi et apice obtusiusculæ, hyalinæ, 7–8 × 3·5 μ. *Paraphyses* filiformes, ascis longiores.

On living leaves of an unknown tree (? *Excœcaria*), in bush near Mofari, *Scott-Elliot*, 4431.

British East Africa.

Ustilagineæ.

Ustilago goniospora, *Massee* (*sp. nov.*). *Sori* nigro-violacei, ætate provecta brunneo-violacei, in ovariis evoluti. *Sporæ* irregulares, sphæroideo-angulatæ, 10–12 μ diam., episporio crassiusculo levissimo, mox secedentes et dein pulverem atro-violaceum efformantes.

In the ovaries of an undetermined *Aristida*, Ukamba, *Scott-Elliot*, 6491.

Sphæropsideæ.

Phoma Euphorbiæ, *Sacc. in Michelia* ii. (1882) p. 339.

On stem of *Tragia*, Mbuyuni, *Scott-Elliot*, 6200.

Hyphomycetes.

Cladosporium Herbarum, *Link, Obs. Mycol.* ii. (1791), p. 37.
On leaves of *Cluytia richardiana*, Muell. Arg., Ukamba, *Scott-Elliott*, 2334.

British Central Africa.

Uredineæ.

Uredo Euphorbiicola, *Sacc., Syll.* vii. (1888) p. 847.
On *Euphorbia hochstetteriana*, ? Pax, Nyika plateau, North Nyasaland, *Whyte.*

Sphæropsideæ.

Diplodia Tragiæ, *Massee* (*sp. nov.*). *Perithecia* subcutaneo-erumpentia, atra, glabra, papillata, globoso-depressa, circa 200 μ diam., sparsa vel subsolitaria. *Basidia* filiformia. *Sporulæ* elliptico-oblongæ, utrinque obtusatæ, 1–septatæ, episporio glabræ, violaceo-fuligineæ, 18–20 × 10 μ.
On stem of *Tragia* sp., between Kondowe to Karonga, North Nyasaland, 2000–6000 ft., *Whyte.*
Allied to *D. Humuli*, Fuckel, but readily distinguished from this and every other species by the dingy violet spores.

Bermuda.

Basidiomycetes.

Psathyra conopilea, *Sacc., Syll.* v. (1887) no. 1060.
On the ground, St. George's, *Cummins.*

Hypholoma bermudiense, *Massee* (*sp. nov.*). *Pileus*, centro excepto, submembranaceus, e subgloboso expansus, glaber, levis, pallide ochraceus, versus marginem æruginascens, viscidus, 3–4 cm. diam. *Lamellæ* sat confertæ, postice rotundato-annexæ, e pallido fuscescentes, acie serrulatæ. *Sporæ* amygdaliformes, violaceo-fuscæ, 7 × 5 μ. *Stipes* æqualis, solidus, albidus, supra annulum angustum glaber, infra floccis squamosis evanidis tectus, 3–4 cm. longus.
On the ground, St. George's, *Cummins.*
Allied to *H. æruginosum*, Curt., but distinguished by the thin pileus and the coarsely serrated gills.

Ustilagineæ.

Ustilago Stenotaphri, *Massee* (*sp. nov.*). *Sori* ex olivaceo brunnei, atri, pulverulenti, ovaria habitantes. *Sporæ* irregulares, ovatæ, oblongæ, sphæroideo-angulatæ, 5–7 μ diam., episporio levissimo crassiusculo, olivaceo-brunneæ.
Parasitic on the ovaries of *Stenotaphrum glabrum*, Trin., St. George's, *Cummins.*

UREDINEÆ.

Puccinia Virg-aureæ, *Libert, Crypt. Arduenn.*, fasc. iv, no. 393.
On living leaf of *Solidago sempervirens*, Linn., St. George's, *Cummins*.

COSTA RICA.

ASCOMYCETES.

Botryosphæria Anthuriicola, *Massee (sp. nov.)*. *Stroma* erumpens, discoideum, atrum, 1–2 mm. latum. *Perithecia* subglobosa, ostiolo vix visibile. *Asci* cylindraceo-fusiformi. *Sporæ* monostichæ, hyalinæ, elongato-ellipticæ, utrinque acutæ, continuæ, glabræ, 17–20 × 4–5 μ. *Paraphyses* filiformes.
On dead leaves of *Anthurium gracile*, Lindbl.; Atino, Prov. Cartago, at 2100 ft., *Donnell Smith*, 6813.

CHILE.

PERONOSPOREÆ.

Cystopus Portulacæ, *Lév. in Ann. Sci. Nat.*, sér. 3, viii. (1847) p. 371.
On living leaves of *Calandrinia axilliflora*, Barn., Santiago *Philippi*.

DCLIX.—MANGABEIRA RUBBER.

(*Hancornia speciosa*, Gomez.)

Beyond brief notices (1892, pp. 67 and 69; 1898, pp. 179, 180) no account of this rubber has been given in the pages of the *Kew Bulletin*. The following short notes appeared in the *Kew Reports*:—

Hancornia speciosa.—Our attention having been drawn to this plant as the source of Mangabeira rubber, steps were taken to obtain, through correspondents, a supply of seeds. These we have received, and the plants raised from them will in due course be distributed. The plant itself is well known (*see* Collins, *Report on Caoutchouc*, pp. 23, 24). The rubber appears to be of good quality, and the tree has also the merit of producing an excellent fruit about the size of an Orleans plum, and yellow in colour, speckled with red. The fruit, in fact, in Pernambuco, is more valued than the caoutchouc.

I extract the following information from Consul Benham's *Report on the Trade of Pernambuco* (1879):—

"Mangabeira rubber is obtained from the trees of that name, which are to be found in large numbers in the interior of this, as well as of the other northern provinces. The reports which I

hear have been received from Liverpool of the reception of this article are far from favourable; the price went up to 2*s.* 7*d.* per lb., but has fallen again, and it would appear that 1*s.* per lb. is about the price obtainable in England in ordinary times. An idea of the great value of this article having got abroad here, the price rose to an absurd figure, having during this last season varied from 8,000 reis, or 16*s.*, to 26,000 reis, or 52*s.* per 15 kilos., or 33 lbs. The method employed in the preparation of the rubber is very primitive, and, I think, may easily account for the article not being well received; if the milk were treated in a more careful manner, there seems no reason why the rubber should not be favourably received. At present the plan adopted is simply to mix alum with the milk, which causes it to coagulate; the lumps of rubber are then placed in the sun, after which it is sent to the market; from this defective mode of preparation a great loss of weight afterwards occurs, frequently as much as 40 to 50 per cent., some say even more." (1880, pp. 47, 48.)

A quantity of good seeds of this plant (*Hancornia speciosa*) were sent to Kew by Mr. C. Craven, of Pernambuco, and were distributed among the following Botanic Gardens:—Brisbane, Calcutta, Ceylon, Demerara, Singapore, Java, and Jamaica. The seeds sown at Kew germinated freely, but owing to damp the plantlets all perished. Apparently this plant prefers a dry atmosphere and a sandy soil. (1882, p. 24.)

The following detailed account of the plant, and of the rubber obtained from it, is translated from a paper by Professor O. Warburg, in *Der Tropenflanzer, Zeitschrift für Tropische Landwirthschaft*, iii., p. 147:—

"Mangabeira rubber is the product of *Hancornia speciosa*, a tree of the Natural Order Apocynaceæ, found in those dry regions of Brazil which lie to the south of the forests of the Amazon. It occurs on the so-called Campos cerrados, in the Provinces of Pernambuco, Bahia, Goyaz, Minas Geraes, Matto Grosso and São Paulo. In the Provinces of Bahia and Pernambuco the rubber is chiefly obtained. The tree is abundant in the Provinces of Goyaz and Minas Geraes, and, according to Edwall,* in such amount as to be a characteristic plant of their Campos cerrados. In the coffee-growing Province of São Paulo, the range of *Hancornia* crosses its northern limit, the Rio Grande, and extends to the Paranaparema on the south, *i.e.* almost to the tropic of Capricorn, but seems to avoid the littoral zone and the coastal range known as the Serra do Mar: the chief places where it occurs are Serra Azul, Cravintras, São Simao, Araraquara, Casa Branca, Riberão Preto. While it is probable that as a wild plant it requires the well-marked dry period of its native campo, it can be grown in a more moist climate to a less luxuriant extent. Towards the west it spreads through Matto Grosso to the boundaries of Peru.

In Paraguay, at Jacuati, to the south-east of Concepcion, Balansa has collected a plant which, if not the same, is a very near ally.

* Gustavo Edwall, "Die Mangabeira," in Deutsche Zeitung S. Paulo, No. 99, 1898.

In the Gran Chaco, and in Paraguay, an abundant tree, known on the Guarani as Manga-icé, and probably identical, yields an excellent caoutchouc which is collected in considerable quantity by a primitive method about Villa San Pedro.

Description.

The Mangabeira tree of the Brazilians attains the size of an apple tree, *i.e.*, a height of 16 to 23 feet, but in the Province of São Paulo fails at scarcely 12 feet. It branches freely, forming a crown, the breadth of which often considerably exceeds the whole height of the tree. Its many rather pendulous branches bear short lateral branchlets, and are leafy only at the extremities. The young twigs are brownish and smooth, the old branches encased in a corky bark. The opposite paired leaves are elliptic or long-elliptic in shape, are contracted towards the rounded apex, 2–4 in. long and $\frac{1}{2}$–$1\frac{1}{2}$ in. broad. The leaf-stalks are short—as a rule but $\frac{1}{5}$ in. long. In nervation the leaf is well marked ; it has a straight midrib from which on either side spring numerous veins parallel to one another, and sometimes forked to support the margin, close to which they end.

The flowers are shortly stalked, about $1\frac{3}{4}$ in. long, and grouped as many as seven together on the ends of the branches. The calyx is small, about $\frac{1}{10}$ in. long, glabrous or hairy, with five small, ovate, obtuse teeth. The corolla is $1\frac{1}{3}$–$1\frac{3}{4}$ in. long, with a long, narrow cylindric tube blocked by hairs at the middle, and with five small lanceolate somewhat reflexed lobes, half as long as the tube. The five stamens are inserted on and enclosed within the corolla-tube, and have lanceolate acute anthers. The style is filiform, long, and bears at its apex a two-lobed stigma. The ovary is two-celled, with many ovules in each cell, of which but one cell and a few ovules mature in the ripening fruit.

This fruit is of the size of a plum, fleshy, with an agreeable taste, and contains the few matured seeds embedded in the flesh. When ripe it is yellow, with blotches and streaks of red. It keeps but a short time, yet is much prized as a food, being eaten fresh and cooked in many ways. While the Portuguese call it Mangába, the natives use the name Tembiú-catú, which means "good to eat." A drink as well as a conserve is made from it.

Climatic Requirements.

According to information from Mr. S. Woldern, British Vice-Consul in Ceará, the tree grows wild in all wooded districts, on sandy soil. For its culture sandy soil in the plains, especially toward the coast, is most suited. The statement that the tree grows from 3,000 or even 4,000 to 5,000 feet above the sea is, according to Marval Irmaos, of Bahia, incorrect, the plateaux on which it occurs being but of 500 to 600 feet elevation.

Cultivation.

But little positive information is to hand under this head. In most of the great gardens of Asia and the West Indies the tree seems not to be grown, although in 1880 steps were taken by

the Botanic Gardens of Kew to cultivate it. Seeds were received and seedlings raised at Kew, but of the result we have no information.

At any rate, the tree needs no shade. Experiments are needed as to the best method of propagating it, which in the Province of São Paulo is done both by cuttings and from seed.

Yield.

Equally is little certain at present about the yield. When four or five years old, or, according to other trustworthy authorities, when six years old, the tree is mature enough to be tapped. This is done by cutting a spiral groove or, as is preferable, oblique incisions in the bark at some distance from one another, eight of such, perhaps, in the whole length of the trunk. Below the incisions, by the use of a little moist clay, a trough is made to catch the juice as it runs out. At the end of a quarter to half an hour the supply is exhausted. This may be 2 lbs. and upwards, though in the rich parts of São Paulo—the terra-roxa (red earth) district, celebrated for its coffee—as much as 11 lbs. of juice may be obtained. A colouring matter in the bark gives to the fresh juice a delicate rose tint.

The latex from the little clay collecting troughs is then poured into larger vessels, and mixed with alum (Stauss' method). This produces coagulation in two or three minutes. Two teaspoonsful of alum solution are sufficient for milk enough to fill two or three bottles. The caoutchouc is then pressed by hand, and hung on sticks in the sun for eight days to allow the water to exude and drain off. The product thus prepared is in the form of large cakes called biscuits; it still contains much water, and belongs to the class of caoutchoucs known as moist rubbers.

It is obvious that the making of the rubber into thin "sheets," instead of biscuits, is of advantage, for it gives facilities for drying, and consequently adds to its value. This mode of procedure has recently begun to take a place in the preparation. Other changes are suggested by Biffen's method of obtaining pure caoutchouc by the use of a centrifugal machine. Cannot some method of collecting and preparing Mangabeira rubber be found which will yield more nearly such a product as the trade desires?

Trade.

"Pernambuco biscuits" are large rectangular cakes of a reddish-brown colour outside, but bright rose-coloured inside, with a peculiar sweet scent, full of cavities containing a solution of alum, and usually with marks of its exudation on the surface. In the working up of the rubber, a loss, sometimes of as much as 40 to 60 per cent., occurs. The caoutchouc is but little elastic, hardens with age, breaks and tears—faults attributed to the presence of the alum. The demand for such rubber is small, and due chiefly to its pleasing colour; and the price in consequence is but half that of Para rubber.

Recently, however, the price of Mangabeira rubber has advanced by reason of the improvement in the purity, and on account of its great suitability, when pure, for certain purposes,

In consequence, the disparity between the price of the best sorts and that of Para rubber is much diminished. At the end of last year, a kilogramme (2 lbs. 3 ozs.) of the best Mangabeira rubber sold for upwards of 12 milreis (almost 8 shillings), a price not far short of that of Para rubber. An additional cause of the advance in price is to be sought in the change in making up the rubber; for, owing to the constant watch which is necessary to guard against adulteration by addition of iron or stones put in to make weight, pieces of rubber only $\frac{1}{2}$–$\frac{3}{4}$ in. thick and 2 ft. long by 10 ins. broad, the so-called "sheets" of commerce, are welcome in the trade.

Of recent years, the exploitation of this source of rubber has taken a considerable extension. And, while the intelligent collectors, who start from Bahia and work toward the interior, have only tapped mature trees, improvident itinerant collectors, making their own profit out of the pressing demand of the time, have in many places mischievously drawn on the supply and threatened its continuance.

The chief centres for export of Mangabeira rubber are Bahia and Pernambuco. A large supply is brought down the river São Francisco, and so to Bahia; and from this town, in 1889, 134 tons were exported; in 1892, 4,362 bales, to the value of £22,826; and in 1893, 3,293 bales, to the value of £20,362. From Pernambuco were exported, in 1896, 54 tons, to the value of £1,800.* A small amount of caoutchouc from the Province of Matto Grosso (probably Mangabeira rubber) is exported down the Parana through Paraguay, and great quantities from Minas Geraes are shipped through Rio de Janeiro.

Recently, the Province of São Paulo has begun to demand a place in the consideration of rubber export. Regions here, such as that through which the Mogyana railway runs, are exploited, even by persons coming from Bahia for the purpose, the owners of the land receiving, in return for the permission they grant, one-third of the clear profits. A worker can collect about $6\frac{1}{2}$ lbs. of rubber per diem, and receives on the spot 75 milreis (£2 9*s.* approximately) per arroba ($32\frac{1}{3}$ lbs.). The arroba is sold in London for 200 milreis. In the first half of the year 1898, no less than 76,498 kilogrammes (approximately 78 tons) of rubber were passed over this railway, and yet the railways of Paulista and Sorocaba equally traverse the country where the Mangabeira tree grows. In consequence of the increasing trade, Santos has become an important centre for rubber, and there, as at the town of São Paulo, now exist mercantile houses whose principal concern lies in this business.

In this Province, an idea of the importance of cultivating and protecting the tree is arising. Many coffee-planters are turning their attention to the sowing of *Hancornia*, and seed is already hard to procure. The Government hoping, by means of the duty on rubber (now standing at 13 per cent. ad valorem), to recuperate its finances, which have become disordered by the depreciation of coffee, has instructed Dr. A. Uchoa Cavalcanti, Acting Director of the Agricultural Institute at Campinas, to inspect the territory

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* Probably an error for £18,000.

in question; and further, the Congress of the State has decreed that the Mangabeira tree shall be protected, and its cultivation extended, as is advisable.

This decree, in brief, runs as follows :—

Article 1. §i. A premium of 25 contos of reis (25,000 milreis, or about £784) shall be paid to him who, within four years' from the passing of this decree, shall show that within a distance of 60 kilometres (37 miles) of a railway, he has planted and cultivated, for 2 years at least, the greatest number of Mangabeira trees, preserving between the trees enough room for their free development.

§ii. A premium of 15 contos (nearly £470) to him who shall have planted the second greatest number.

§iii. A premium of 15 contos to him who shall have fulfilled all the conditions of the first paragraph, excepting the requirement with regard to the distance from a railway.

§iv. A premium of 25 contos to him who, within the same space of time, and within the prescribed 60 kilometres of a railway, shall have cultivated, for two years' at least, the greatest number of Mangabeira trees, provided that at the same time he shall have enclosed the ground, and removed all other trees.

§v. A premium of 15 contos to whoever shall have cultivated, etc., the second greatest amount.

§vi. A premium of 15 contos to whoever shall have fulfilled all the conditions of the fourth paragraph, except the requirement with regard to the distance from a railway.

§vii. A premium of 10 contos (about £313) to whoever shall prove that within the same lapse of time he shall have acclimatised in a manner profitable from the agricultural standpoint any other species of rubber tree, *e.g.*, *Manihot Glaziovii*.

Article 2. A premium of 15 contos of reis to whoever shall show that within the same time he has devised the best method of extracting the latex.

Although but little is known so far of the cultivation of Mangabeira, it may be said that there is a considerable probability of it becoming an important tree in rubber-culture. The apparently easy accommodation of the tree to soil and climate, its early and considerable yield, together with the fact that even under the rough treatment of the Indians it preserves its fruitfulness, and also the facility with which it can be cultivated, promise a future. And, taking a wide view of its possibilities, from its presence in the red coffee-growing soils of the west of the Province of São Paulo, it appears suitable for the red-earths of the German Colonies of Africa, Usambara and Togoland alike, such, for instance, as occur at Misahöhe, in the latter colony. For these soils it promises to be considerably better suited than the Ceara rubber plant (*Manihot Glaziovii*), and the Para rubbers (*Hevea*), and will probably give better results than *Castilloa*, than which it is more hardy, earlier maturing, and smaller."

DCLX.—MISCELLANEOUS NOTES.

Mr. William Hales, a sub-foreman in the Royal Botanic Gardens, has been appointed on the recommendation of Kew, Curator, to the reorganized Chelsea Physic Garden.

Mr. Albert Howard, B.A., Scholar of St. John's College, Cambridge, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Lecturer in Agricultural Science in Barbados.

The news of the sudden death at the early age of 56, of Henri Lévêque de Vilmorin, on August 24th, at his country seat, Verrières, near Paris, was received at Kew with the profoundest regret. De Vilmorin had worthily continued the traditions of the great house of Vilmorin Andrieux et Cie., in which he succeeded several generations of his family. Its business of seedsmen is no doubt the most widely extended and possibly the largest in the world. Its affairs constantly brought him to England, and he rarely failed on such occasions to visit Kew, to which he never ceased to extend the warmest friendship. He could not in fact have shown more interest in or regard for its work had it been an institution of his own country.

But it was not as a mere man of business that De Vilmorin will be remembered. He brought a keen scientific intelligence to bear upon the variation of plants under cultivation, and his numerous writings will always remain classical authorities on the subject. These pages owe to them the interesting account (*K. B.* 1879, pp. 317–8) of the process, in which he had so large a share, by which the sugar beet has been brought to its present condition as a commercial source of sugar.

The name of few men was better known throughout Europe; it might be even said throughout the civilised world. A man of dignified presence, with singular charm of manner, and an alert and sympathetic mind stored with the most varied but precise information, he at once attracted attention in any society. Kew had frequently to invoke his aid when the needs of our colonies required the resources of a warmer climate than that of the British Isles; and when one asked De Vilmorin to do a thing, one could rely upon its being as effectively accomplished as if one had done it oneself. A loveable nature, a fine enthusiasm, and a sterling integrity inspired a noble character.

Botanical Magazine for August.—A quarto plate is given to *Aloe Schweinfurthii*, a magnificent species discovered by Dr. G. Schweinfurth in North-east Tropical Africa. It flowered in the garden of Thomas Hanbury, Esq., of La Mortola, in February. *Heliophila scandens* is one of the remarkably few Cruciferæ with a scandent habit. The Kew plant, which was received from

J. Medley Wood, Esq., A.L.S., Curator of the Natal Botanic Garden, in 1885, flowers annually in the Succulent House during the winter. The flowers are white, or sometimes slightly pink, and fragrant. *Aster Piccolii*, a new species, was raised from seed collected in North China by Father Piccoli, of the Jesuit Mission, and received at Kew through G. Murray, Esq., F.R.S., of the Natural History Museum, South Kensington. It is a useful species for the flower garden, and interesting botanically on account of the absence of pappus. *Ephedra altissima* was drawn from material also sent by Thomas Hanbury, Esq. Its abundant bright-red fruits render it a striking object in the gardens at La Mortola. It is a native of North Africa, and is not hardy in Great Britain. *Mussænda capsulifera* is a pretty white-flowered species from Socotra, whence seeds were brought by the late Mr. G. Theodore Bent, in 1897.

Botanical Magazine for September.—*Coleus thyrsoideus* is a free-growing species from British Central Africa, whence Herbarium specimens bearing fertile seeds were sent to Kew by A. Whyte, Esq., F.L.S. The flowers are rather large, bright blue, and are borne in long terminal panicles. *Begonia sinensis* is a tuberous-rooted species with small pale rose-coloured flowers. Seeds from which the Kew plants were raised were received from Dr. A. Henry, M.A., F.L.S., who collected them in Yunnan. *Calathea picta* is one of Mr. Bull's recent introductions from Brazil, and has been distributed under the name *Maranta picta*. Its leaves are dark velvety green above, marked with blotches of pale green, and purple below. *Asparagus scandens* is the first representative of the genus figured in the *Magazine*. This species was introduced into England from the Cape by Mr. Francis Masson at the end of the last century. The specimen drawn was sent to Kew by Mr. Leech, of the gardens at Woodhall, Dulwich. *Dorstenia Phillipsiæ* is a curious species from Somaliland, where it was discovered by Mrs. Lort Phillips and Miss Edith Cole, who sent the plant from which the drawing was made to the Botanic Garden, Cambridge. In habit it closely resembles *D. arabica*, Hemsl., of which a figure appeared in *Hooker's Icones Plantarum*, t. 2503.

Flora Capensis.—Part 3 of vol. vii., edited by the Director, was published in September. It contains a further instalment of the elaboration of the *Gramineæ* by Dr. O. Stapf.

Flora of Tropical Africa.—Part 1 of vol. v., edited by the Director, was published in September. It contains the first instalment of the examination of the *Acanthaceæ*, a family largely represented in the tropics of both worlds, and but scantily in temperate regions. This has been undertaken by Messrs. I. H. Burkill, F.L.S., and C. B. Clarke, F.R.S. The latter gentleman brought to bear upon the work a unique knowledge of the Indian

representatives of the family. The discrimination of genera and species in it is both intricate and difficult, and Mr. C. B. Clarke was unable to complete his work without a visit of some duration to Berlin to study the African species described by German botanists.

Botanic Station, St. Lucia.—It has been constantly insisted upon in the *Kew Bulletin* that the only chance for some improvement in the present distressed condition of the West Indies is to multiply as much as possible the cultural industries. Administrator King Harman's Report on St. Lucia for 1897 (pp. 18–20) affords an interesting example of what has already been done in this direction in that Island.

Botanic Station.

"Much activity has prevailed in connection with the Botanic Station, in which an increasing interest is shown by the general public. Plants were distributed throughout the Island to the number of 21,138, exclusive of 9,000 ginger sets given gratis to purchasers of Crown lands, and an impetus has been given to the cultivation of Liberian coffee, cocoa, nutmegs and kola, the number of each disseminated by sale, exchange or free gift being as follows :—

—	Sale and Exchange.	Free.	Total
Liberian coffee	10,942	5,994	16,936
Cocoa	44	1,302	1,346
Nutmegs	444	463	907
Kola	214	704	918

The following table, shewing the number of economic plants distributed during the last three years, affords satisfactory evidence that the station is increasing in favour with the public, and that its sphere of usefulness is being constantly enlarged :—

Year.	No. of Plants Distributed.
1895	4,380
1896	19,504
1897	22,179

In addition to the assistance given to the planting community at the station itself, the Curator is paying periodical visits to the several districts of the Island for the purpose of giving lectures and practical demonstration upon agricultural topics, in the hope of encouraging an extended cultivation of the most useful and valuable economic plants upon rational and scientific principles.

The site of the present station leaves unfortunately much to be desired, and with a larger area and more suitable land the advantages now offered will be brought home with greater force to the general public.

Cocoa.

The crop for 1897 was a small one, owing to the heavy rainfall and wind experienced during the flowering period of May and June. The cultivation is slowly increasing, and it is hoped that the excellent results obtained by the few planters who apply intelligent methods to the treatment of their crop may, together with the sound advice tendered by the Curator of the Botanic Station when on his lecturing tours, induce the petty proprietors to improve on the primitive system to which they obstinately cling.

Coffee.

Liberian coffee is proving to be well adapted to the soil and climate of St. Lucia, and its culture is being extended. The demand for seeds and plants is increasing, and improved machinery for curing the crop is being imported.

Kola.

The cultivation of kola is being slowly extended and one shipment has been made to the London market, where good prices were obtained.

Ginger.

The cultivation of this spice is at present being tried by one or two planters only, but a shipment which was made in the month of June realised 70 – per hundred weight, and the profitable nature of the undertaking is being brought to the knowledge of the people.

The estimated acreage of the products cultivated in the Colony is given in the following return :—

—	Sugar Cane.	Cocoa.	Coffee.	Spices.	Provisions.	Other Cultivation.	Pasture.	Total Cultivation.
Acres	5,234	3,940	104	11	3,944	323	12,234	25,790

The estimated acreage of the Colony is 152,320."

Chelsea Physic Garden.—The following account of the re-organisation of this old Botanic Garden is extracted from the *Times* of April 18, 1899 :—

"The garden was established by the Society of Apothecaries in 1673. In the first instance, the ground was apparently leased by them from Lord Cheyne as a site in which to keep the ornamental barge that was a usual appanage of a City Company at that period, but at least a portion of it was almost immediately devoted to the culture of herbs for the use of the Society's laboratory. From the beginning the Apothecaries evidently felt its expenses a serious burden on their resources. Some 40 years after it was established, they approached Sir Hans Sloane, who had purchased the manor of Chelsea from Lord Cheyne in 1712, with the desire of obtaining his assistance, and the outcome was that in 1722 he granted them the land for ever in consideration of a yearly rent of £5 to the end that "The said gardens may at all times hereafter "be continued as a Physic Garden, and for the better encouraging "and enabling the said Society to support the charge thereof, for "the manifestation of the power, wisdom and glory of God in "the works of the Creation, and that their apprentices and others "may better distinguish good and useful plants from those that "bear resemblance to them and yet are hurtful, and other the "like good purposes."

The grant further provided that, if the conditions were not fulfilled, or if the Society should at any time convert the garden into buildings for habitation, or to any other uses save such as were necessary for a Physic Garden, it should be lawful for Sir Hans Sloane, his heirs and assigns to enter upon the premises and hold them for the use and benefit of and in trust for the Royal Society, or if that body refused to accept the duties entailed, then in trust for the College of Physicians of London, subject to the same conditions as those originally charged on the Apothecaries.

In spite of these very clearly-expressed intentions on the part of Sir Hans Sloane, who may in a sense be regarded as the "pious founder" of the garden, on several occasions the alienation of the place to other purposes has been distinctly contemplated. In 1893 the Apothecaries formally applied to the Charity Commissioners with the intention of getting their trusteeship discontinued. In the absence of any endowment specifically applicable to the garden (with the exception of two bequests of £200 and £100 respectively) the cost of maintenance fell heavily on their corporate revenues. Moreover, it was urged on their behalf that, as a botanic garden, the place possessed neither merit nor attraction, and that it was impossible to galvanize it into a state of active and beneficial usefulness. They had carried it on of recent years, they said, only in the hope that it might be utilized for other purposes, and because of its potential value, the latter being the reason why rather than relinquish it they would prefer to allow it to become a wilderness. In this connection, it may be mentioned that the value of the site, which extends to about 3¼ acres, is estimated at fully £50,000 as a freehold property.

After the Society's application proceedings were delayed for a few years pending the report of the Gresham University Commission, but in 1897 the whole question was thoroughly thrashed out by a Treasury committee, consisting of Sir Henry Longley, Sir W. T. Thiselton-Dyer, and Mr. Spring-Rice. The first points they investigated were the suitability of the garden for the purposes of its original foundation, and the extent to which those purposes are within the range of the scientific requirements of the present day. They came to the conclusion that the place is still fitted for botanical uses. With an airy and open position, it is well set up to the south, and, if the ground shows signs of exhaustion, that is due to its having been starved in the past, and could be remedied by liberal application of manure. The natural soil, they were informed, is distinctly superior for botanical purposes to that of Kew Gardens, which, by the way, it is interesting to note, are in a sense an offshoot of the Physic Garden, having been first organised in 1759 by William Aiton, a pupil of the Philip Miller who was appointed gardener at Chelsea in 1722. Nor, again, had they any doubt but that the garden is capable of being usefully employed for the promotion of botanical science at the present time, since the evidence they received from several educational institutions showed that there exists a considerable body of students of botany, to whom such a garden would be of immense advantage, both as a place where growing plants can be observed and as a source whence specimens may be obtained. Having decided as to the practical usefulness of the garden, the committee proceeded to discuss ways and means of maintaining it efficiently. In considering this question they held firmly to the principle that, as the original trusts were strictly educational in character, in any scheme of reconstruction it must be devoted to serious scientific and educational purposes, and not given up to the perambulators of the nursemaid or the fantasies of the ornamental gardener. Moreover, they felt that any course of administration tending to give it the character of a public park or recreation ground for local residents would weaken its claim to support from general taxation. Ultimately they decided that it was not desirable to hand it over to any existing body. If it were entrusted to the County Council, which, they noted, has no power to make any permanent appropriation of funds for such an object, they foresaw that the fact of its being maintained out of local rates might possibly lead to its diversion from strictly educational purposes to those of a recreation ground, while, if its administration were undertaken by a Government Department, Parliamentary pressure might be brought to bear for the same end. The solution of the problem they found in a new body specially constituted for the administration of the garden and representative not merely of the educational interests involved, but also of bodies able and prepared to furnish funds; for they thought that such a body would not only be free from popular influences likely to impair the educational value of the garden, but would also represent both the Imperial and local elements of the original trust.

The arrangement proposed on these lines by the committee was considerably modified because the trustees of the London parochial charities found themselves able to take a much larger share in the administration of the garden than was at first expected. In the

scheme sanctioned by the Charity Commission the trustees of the London parochial charities are the sole trustees of the garden, while the management is vested in a committee consisting of 17 members. Of these, one is *ex officio*, and is either the person entitled as the representative of Sir Hans Sloane to receive the yearly rent of £5 under the indenture of 1722, or some one nominated by him. The others are appointed, nine by the trustees of the London parochial charities, and one each by the Treasury, the Lord President of the Council, the Technical Education Board of the County Council, the Royal Society, the Pharmaceutical Society, the University of London, and the Society of Apothecaries and the Royal College of Physicians in turn. The charity and its endowments are to be administered exclusively for the promotion of the study of botany, with special reference to the requirements of general education, scientific instruction and research in botany (including vegetable physiology) and instruction in technical pharmacology as far as the culture of medicinal plants is concerned. Existing buildings are to be adapted or new ones constructed for the purposes of offices and rooms for lectures and experimental teaching with the aid of botanical specimens, while a physiological laboratory with appliances for demonstration and research may also be provided. In support of the institution the trustees are to contribute out of the income of the City Parochial Foundation an annual sum not exceeding £800, together with such an amount of capital for the equipment of the garden and buildings as may be agreed upon with the Charity Commissioners. In return the students of institutions receiving aid from the London parochial charities are eligible for admission without fee. So long, too, as not less than £150 is paid annually to the trustees out of moneys specially provided by Parliament, the same privilege is accorded to the Royal College of Science, and its students, professors and teachers are to be entitled to use for purposes of teaching or research the garden, botanical collections, and lecture rooms for not less than three hours on each day between April 1 and October 31, and on two days of the week during the rest of the year. In other cases the rules for admission and the fees (if any) to be charged are within the discretion of the committee of management, subject to the approval of the Charity Commissioners."

Uganda Juniper.—The following note deserves recording, if only to commemorate the late Capt. B. L. Sclater, R.E., who sacrificed a life of promise in opening up the access to Uganda from the coast, and added one more name to the band of distinguished men who have perished in the work of African pioneering.

The promised specimens were never destined to reach Kew. But there is little doubt that the Juniper referred to is *Juniperus procera*, Hochst. Roth says of it on the label of an Abyssinian specimen in the Kew Herbarium:—"Arbor altissima, sylvas constituens, unica e familia Coniferarum. Lignum usitatissimum." The other Conifer is most probably a *Podocarpus*.

Extract from Captain B. L. Sclater's letter, dated Eldoma, Mau Escarpment, British East Africa, April 9th, 1896, to Mr. P. L. Sclater, F.R.S.

"I think I told you about the Juniper forests on the top of the Kedony Escarpment. The forests to the north of Lake Naivasha are of the same Juniper, and we are building the bridge over the Morendal with it. It is also extremely plentiful here, and I have seen large trees 200 feet high, and at least 8 feet in diameter at the base. There is also another kind of conifer here, more like a pine, which grows to a good size. There are plenty of young junipers here, but I have not yet been able to find cones of either sort. Please let me know if they are known at Kew, as I can easily send home specimens of the wood and leaves. I will get the cones if I can."

Mr. Alexander Whyte, F.L.S., Curator of the Botanic Station, Uganda, writes, January 20th, 1899 :—

"The juniper is a most excellent timber, and will prove a source of revenue now that the railway is nearly up to the Nirobi forests. Sclater's bridges are made of it, and they are as good as the day they were erected."

Soudan Products.—Comparatively little is known at present as to the available resources of the Soudan. The following preliminary account appears in the *Board of Trade Journal* for July of the present year (pp. 30, 31) :—

The Foreign Office have received, through H.M. Agent and Consul-General at Cairo, a report by Sir William Garstin, K.C.M.G., on the Egyptian Soudan, of which the following is an extract :—

"A very possible source of future wealth to the Soudan lies in the vast forests which line the banks of the Upper Blue Nile and extend, in an easterly direction, to the Abyssinian frontier. In the Bahr-el-Ghazal Province also, particularly in the Bongo country, large forest tracts exist.

The ebony tree (*Dalbergia melanoxylon*) is met with south of Karkauj, on the Blue Nile, and again in the vicinity of the Sobat River. This tree does not, in these latitudes, attain to a very large girth, 9 inches being apparently its maximum diameter. It must, however, be very common in these forests, as most of the principal houses in Omdurman are roofed with it. The value of *Acacia arabica*, from which the white and red gum is obtained, is well known ; while the other kinds of acacia, such as *Acacia nilotica* (in Arabic, "Sant"), are the chief source of the fuel supply.

A bamboo is met with in the ranges of hills to the south of Famaka, and, according to some, "mahogany" is found in the forests round Fazogl and in the Beni Shangul country.

The means of transporting such woods can only be by the river. Unfortunately, neither the ebony nor the acacia will float in water, and, therefore, such transport is debarred in these cases. If a good and serviceable timber tree can be

discovered in the Blue Nile forests which can be floated down the river to Egypt, a large source of revenue will undoubtedly have been found. Extensive saw-mills might be erected at Assouan, utilising the power available at the dam, now under construction, and an important timber trade might one day arise.

On the White Nile, in the Bongo and Rohl districts, the india-rubber creeper (*Landolphia florida*) is found in great profusion. If the rubber yielded by this creeper be not of quite so good a quality as that obtained from the Assam india-rubber tree (*Ficus elastica*), it is still of sufficient value to be counted as an important asset in the future trade of the Soudan. This plant, which has large laurel-shaped leaves, and a white flower resembling a jasmine, requires several years to mature before yielding rubber in any quantity. The natives obtain what they require by tapping the stem, usually in such a reckless manner that the creeper dies under the operation. The Assam india-rubber tree should certainly flourish well in most parts of the Soudan, more particularly south of Khartoum. Although this tree takes from twenty to thirty years to arrive at a girth sufficient to permit of regular tapping, its yield is so valuable (about 3*l*. per tree per annum) that its introduction into the country is well worth attempting.

It is very much to be hoped that a scientific examination of the Soudan forests may ere long be carried out under the superintendence of an expert. An Indian forest officer (from Burma for choice) might be deputed for this purpose. It is certain that much valuable information would be obtained from his report. Such an appointment needs no recommendation—its necessity is obvious. A trained forest officer could, moreover, render good service by advising the Government as to the best method of preserving the valuable fuel supply which at present exists on the banks of both rivers. This supply, although apparently inexhaustible, must speedily diminish, unless the cutting and felling of the areas is carried out upon some regular system which will permit of the young trees growing up and replacing those cut down. It is, of course, inevitable at present that the felling should be carried out in a wasteful manner. Fatigue parties are landed from the boats, and are required to cut the largest amount of wood in the shortest possible time. The men have no idea of the value of the trees, and naturally select those which are nearest to the water and easiest cut. Should this practice be continued, it is certain that a few years must see a great diminution in the belt adjacent to the river. On the Blue Nile even the valuable gum-producing acacias are being felled for fuel."

Cochin China Gutta-Percha.—Enquiries having been made as to this product and the plant producing it, the following note is reproduced from the Kew Report for 1881 (pp. 45, 46):—

M. L. Pierre, [late] Director of the Botanic Garden, Saigon, gives in the *Excursions et Reconnaisances*, no. ii., published by the French Colonial Government at Saigon, an interesting account of the gutta-percha derived from *Dichopsis krantziana* (Pierre *in*

Beauvis, Contr. Gutta-Percha 60, t. 1), which appears to be a source of one of the inferior qualities met with in commerce. As the publication appears difficult of access in Europe, I quote his remarks :—

" This tree furnishes a large quantity of a milky juice, which yields a gutta of inferior quality, judging from experiments made by experts in Paris. It must be remarked, however, that the sample experimented on was obtained by the defective method used by the Cambodians in the manufacture of torches and had become resinous. The Cambodians sell it to the Chinese, who export it to Singapore, where it is sold as an inferior kind of gutta. The product, in fact, altogether varies in its texture according to its mode of preparation. The milky juice left to itself and coagulated yields a whitish substance which is not resinous nor glutinous. The absence of the last character is an essential property of good gutta. When on the contrary the milk is coagulated with hot water, it has a glutinous texture highly injurious to its commercial value. In this state it is useless, except to mix with gutta of better quality. To prepare it properly it should be poured into earthern vessels and allowed to slowly evaporate without the application of any artificial heat. The process is slow, but it is that which is employed in Malaya in the preparation of the best sorts of gutta." (p. 227.)

M. Pierre very obligingly communicated a specimen of his Cochin China plant to the Kew Herbarium. Mr. C. B. Clarke remarks upon it :—" Seems very near a species I have made, " *Dichopsis Helferi*, on a Tenasserim tree, of which the fruit is " not known. The leaves do not quite match either in shape or " in number of nerves, nor are the sepals exactly the same. They " may be one tree nevertheless."

Rattan Industry of Rheims.—The following account is extracted from the *United States Consular Reports* for January, 1898. The use of canes and rattans is to some extent displacing that of willows for basket work. The suggestion has been made that the species of Calamus which yield rattans and canes might be introduced into the forests of Tropical Africa, where a few species of the genus already occur.

" Rattan is the name given to more than one hundred species of climbing palms of the genus *Calamus*, natives of inter-tropical Asia and Africa, most or all of which are perennial, simple or unbranched, cylindrical, jointed, very tough and strong, from the size of a goose quill to the size of the human wrist, and from 50 to 100 feet in length.

In the regions where it grows wild, rattan renders forests inaccessible by reason of its long, tough, and thorny stems, running from tree to tree and on the ground. These stems are used in the manufacture of numerous articles, the principal among which are walking sticks (very much in demand and often very high priced), riding sticks, cables, and very strong ropes, and when split into thin strips, are used for making seats of chairs, baskets, withes and thongs, and all sorts of wicker ware.

One species of rattan—the *Calamus Draco*—from which is extracted a red, resinous substance, is employed for medicinal purposes.

From India is taken the rattan used in making walking sticks; its stem is very long, a little over 0·39 inch in thickness, with joints 19·68 to 39·37 inches apart.

From Cochin China and the Sunda Islands are annually exported large quantities of *Calamus rudentum*, one of the largest kinds of rattan, used for cables and ropes. Its stem is very long and 0·78 inch thick near the middle, and from 1·37 to 1·96 inches in the lower part, its joints being often 78·74 inches distant from each other. These natural cables are so resistant and strong that, it is said, they are used for capturing wild elephants. Strong and handsome walking sticks are made from this species, and also from the *Calamus Draco*, the joints of the latter being from 59 to 62 inches apart.

From the Sunda and Philippine Islands are taken: (1) the *Calamus equestris*, used in the manufacture of riding sticks, a species from 196 to 221 feet in length and no more than 0·39 inch in thickness, with its joints 7·87 inches apart; (2) the *Calamus viminalis*, a species slimmer than the latter, which is used for wicker ware.

The manufacturers of rattan in the consular district of Rheims buy their raw material in Germany and Holland, whither it is shipped from Dutch India after a first preparation.

First of all, the bark is taken off and is used for making seats of chairs. The core of the stem is then split into several thin pieces and rounded off, when it is ready for making baskets.

To whatever use the rattan is put, it must be first decorticated and scraped. If it is desired to bend or plait it, it is softened in hot water, to which is added muriatic acid. Thick rattan is bent with light saw cuts, as is done with ordinary mouldings.

The output of the factories of this region is mostly consumed in the neighbouring territory and sold to wicker workers residing therein; the balance is purchased by Paris and a few London firms.

There are only two important and well-known rattan factories in this consular district which do a very good business.

Raw rattan, taken on board vessels in French ports, sells as follows: First quality, \$15.44, and second quality, \$13.51, per 100 kilograms (220.46 pounds.)

HENRY P. DU BELLET,
Rheims, November 27, 1897. *Consul.*

Sugar-cane in Sandwich Islands.—In the competition between the sugar-cane and the bounty-fed beet root it can hardly be doubted that with the increased amount of solar energy available in the tropics, the sugar-cane ought to hold its own, if the same scientific resources were brought to bear on its improvement and cultivation. In other words, the sugar-cane industry will have to be reorganised. What has been done in this direction in Queensland is touched upon in the *Kew Bulletin* for 1897, p. 96. The

following extract from Mr. Acting Consul-General Kenny's *Report on the Trade of the Hawaiian Islands* for the year 1897 (*Foreign Office, Annual Series*, 2193, pp. 7, 8), gives an interesting account of the state of their sugar industry :—

"The sugar industry of the Islands prospered during the year 1897, all the plantations paying large dividends.

Although the financial success of the sugar business is largely due to the treaty of reciprocity with the United States, there can be no doubt that a considerable measure of it is also due to the intelligent systems which have been adopted by the planting community, and to the introduction of improved methods of agriculture and manufacture.

A few years ago the sugar planters of the Islands formed themselves into an association, and established a laboratory and experimental station, from which much benefit has been derived. The director of this association makes periodical visits to the plantations, and prescribes such fertilisers as may be required, after a careful analysis of the soils has been made by the chemists of the association. The analyses of all fertilisers used by the planters has to be guaranteed by the manufacturers, who are not paid until their goods pass the tests made for the buyers. In this way fraud and careless manufacture are checked, and the planters are protected.

At the experimental station of the association, sugar-cane of different varieties is grown and tested, and various experiments of value are continually being made in fertilisers, irrigation, and other matters connected with the successful raising of sugar-cane.

The favourable weather of 1896, and the unusually large area of cane harvested, brought the 1896–97 crop to the highest point yet reached, which, according to the planters' association returns, was 251,126 tons, of 2,000 lbs.

The 1897–98 crop will, probably, be under this, owing to the exceedingly dry weather last year, which seriously interfered with the growth of cane in the unirrigated districts.

After much experimenting it has been finally decided that the most effective machine for the extraction of the juice from the cane is the "nine-roll-mill," which is made up of three three-roll-mills, so that the cane is pressed six times, and on its passage from one mill to the next it is subjected to "maceration," by means of a stream of hot water, which assists in forcing the cane to yield its juice. The rollers of these mills vary in size, but the usual measurement is 30 inches in diameter and 60 inches in length, though some mills in use and now being erected have slightly larger rollers. The pressure of all these new mills is controlled by hydraulic means. The Krajewski Crushers and the National Shredders are used in several factories in front of the mills, and they are both said to do good work in the preparation of the cane for the rollers.

Clarification of juice by the Deming apparatus is gradually extending, and crystallisation in motion is now attracting the attention of those interested in the introduction of what is best amongst the novelties of sugar-making.

Amongst the advantages claimed for the Deming system by those acquainted with its working are, that it economises from

25 to 33 per cent. over the open system and secures better results, that it is nearly automatic, one man easily operating all its parts, and that the saving in labour often exceeds 10 per cent. on a sum twice greater than the total cost of the system.

Chemical control in the sugar houses is still somewhat neglected, although there are marked indications of a desire on the part of mill managers to have resident chemists to check all losses."

Ceroxylon andicola.—Mr. R. B. White, an old correspondent of Kew, sends the following interesting account of what appears to be a well-marked local variety of this palm :—

MR. R. B. WHITE to ROYAL GARDENS, KEW.

Tulua, Department of Cauca,
Republic of Colombia,
December 1st, 1897.

DEAR SIR,

I SEND you by parcel post some seeds of what I believe to be an interesting variety of *Ceroxylon andicola*. This palm, as you know, is found only in the Central Andes. Its inferior limit is 7,000 ft. with a mean temperature of 60°, but it is most abundant at 8,000 to 9,000 ft. with a temperature of 55° to 57°.

The palm of which I send you seed is found in the Western Andes, 60 miles south of Cali, in the valley of Cajamarca on the Pacific watershed. It is most abundant at an elevation of 5,500 ft. in a mean temperature of 67° to 68°. Good sugar-cane grows alongside of it.

The flowers, fruit, &c., are similar to those of *C. andicola*, but the tree is very distinct. It has no base of fasciculated rootlets as *andicola* has, but springs clear from the ground. The stem is slighter and not so tall as *andicola*, and I should say that 150 ft. is the average height. The leaves are 20–25 ft. long, but much slighter and lighter than *andicola*, and there is only just sufficient white scale on the underside of the pinnæ to give them a whitish colour. Whilst the leaf is not fully formed and hardened the pinnæ are joined together at the points by a slender thread, as in some Attaleas and Sabals, and I have not noticed this peculiarity in *andicola*. The wax which coats the stem is as abundant as in *andicola*, but seems different in composition ; it has an agreeable smell when rubbed or burned which the wax of *andicola* has not, and it is more brittle, which would seem to indicate a larger proportion of resin. I send you a small sample, and if you find it to be worth experimenting upon I can send you more. The resinous and fatty matters ought, I think, to be examined separately.

The fact of this palm growing in a warmer climate ought to make its acclimatisation easier, and it may turn out to be more valuable than *andicola*.

I should mention that the farinaceous pulp within the rind covering the seeds is slightly bitter, but the hogs do not mind this and avidly devour the whole fruit, and fatten well upon it.

A palm yields here about 800 lbs. of fruit in two flowerings annually. In other countries it may only flower once, producing

say, 400 lbs. Being equal to maize for fattening pigs, these 400 lbs are worth $3.20, supposing maize to be worth 80 cents per 100 lbs. The hogs pick up the fallen fruit.

The palms may be climbed as they climb coco palms, and the wax scraped off. Here they cut down the palms, and each one yields from 15 to 25 lbs. of wax.

When mixed with tallow and made into candles the wax of *andicola* gives a bad smell to the smoke, which I do not think would happen with the wax of the Cajamarca palm.

It may be that the prehistoric aborigines acclimatised *andicola* in the Western Cordillera and so produced this variety. If not a new species, a fair name for it would be *Ceroxylon andicola occidentalis*.

I shall hope to hear what you think of this palm.

I remain, &c.

(Signed) ROBERT B. WHITE.

The Director, Royal Gardens, Kew.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 155-156.] NOVEMBER and DECEMBER. [1899.

DCLXI.—JARRAH AND KARRI.

THE use of the two West Australian woods, Jarrah and Karri, especially for wood paving, has been the subject of several articles in the *Kew Bulletin* (1890, pp. 188–190; 1893, pp. 338, 339; 1897, pp. 219–221; and 1899, pp. 72–75).

The demand for these timbers has continuously increased. They are not produced except in the Colony of Western Australia, and the extent of the forests producing them and the consequent available supply are matters of some interest. These points were fully discussed by Mr. J. Ednie-Brown, the Conservator of Forests for the Colony (whose death has, unhappily, recently occurred), in his *Report upon the Forests of Western Australia*. The first edition published in 1896 having been exhausted, a second was issued in 1899. As it is not readily accessible in this country, the following accounts of Jarrah and Karri are extracted from it (pp. 10–15).

It may be noted that the Timber Museum of the Royal Botanic Gardens (No. III.) contains a magnificent log of Jarrah, weighing nearly five tons, which was shown at the Colonial and Indian Exhibition. It also contains a log of Karri exposed between high and low-water mark in Western Australia for 42 years, and still in good condition. This is noteworthy, as it will be seen there is some doubt as to its capacity for resisting decay under such conditions.

"Within the last three years the Colony, from an indefinite and comparatively little-known market, has bounded into a leader of export timber trade with most parts of the world. We are now very large exporters of timber to America, India, the Continent of Europe, and, of course, to Great Britain; and there are signs that before long we shall have considerable dealings in this way with progressive China and Japan.

Over nearly all the world, and more particularly in England, there has arisen a wonderful demand for "Australian Hard Woods," which, to a large extent, means those of Jarrah and Karri; and

as the trees of these kinds are purely endemic to this Colony, it follows that most of the quotations bearing this name refer only to the timbers of Western Australia. This fact is most satisfactory, and points emphatically to the value of our forests, and how necessary it is that they should be properly looked after by systematic conservation in order to ensure their permanency.

Our timbers from some cause seem to meet the requirements of outside constructive works all over the world, and hence the demand for them. Again, perhaps, the great "run" which is now being made upon the woods of the forests of Western Australia, apart altogether from the fact of their undoubted excellence, is that large quantities of the same kind of tree can be obtained from considerable areas without any material intermixture of other kinds. This fact is, of course, of very great advantage to timber getters, in that it tends to very materially lessen the working expenses of moving machinery, and all the other expenses incurred in connection with the securing of large quantities of one particular kind of timber. Our timber trees are chiefly gregarious. This is, fortunately, particularly the case with the two principal kinds, Jarrah and Karri, although, as a rule, the former is always found torming a sort of fringe to the latter, but never the latter to the former. This peculiarity of specially marked habitats for specific trees is a distinctive feature of the forests of Western Australia, and, as I have already indicated, is one of the points of strength in the disposal of her timbers.

Something over one million acres of forest land have now been leased from the Government for the purpose of acquiring the timber upon them. This is chiefly Jarrah country, and embraces some of the finest forests of that particular kind of tree. It has been taken up in blocks ranging in size from one to over one hundred thousand acres, and, although only a small portion of the whole is as yet being worked, the probabilities in this respect in the near future are immense, and will soon reach fabulous figures. At present there are only some forty saw mills at full work in our forests, but even in connection with these the following interesting figures have been collected :—Strength-power of mills, two thousand five hundred and fifty-four horse-power ; number of all persons employed in connection with the working of the mills, two thousand five hundred and eighty ; number of horses and bullocks employed upon the works, one thousand eight hundred and forty-seven ; and length of private tramways and railways on the various properties, two hundred and fifty miles. Altogether it is calculated that, including their families, there is something like one-thirtieth of the population of the Colony dependent upon the timber industry for its support. This is gradually increasing, so that it will be seen that forests play a very important part in the welfare of the Colony.

A Department of Woods and Forests has now been pretty well established, and its general usefulness as regards the control and management of this enormous natural wealth of the timber resources of the Colony is beginning to be recognized and appreciated by the mass of the people, and of the various individuals and companies directly and indirectly connected with the industry.

JARRAH.

(*Eucalyptus marginata*, Sm.)

This is without doubt the principal timber tree in the Western Australia forests. It is predominant above all others in its extent of forest, the various uses to which it is or can be applied, the part which it is now taking in the great timber export of the Colony, and the esteem in which it is held in the country. Jarrah and Western Australia are almost synonymous words, and, as this has been the case from the earliest days of the foundation of the Colony, so it will remain as long as a Jarrah forest exists. I do not mean by these remarks to disparage in the least degree any of the other commercial woods of the country, but simply to emphasise the fact that Jarrah is the principal indigenous timber of this part of the Australian Continent. There are other timbers in our forests which are equally, if not more, valuable, for their own special purposes, but for general constructive works, necessitating contact with soil and water, the timber of this tree stands foremost.

The specific name (*marginata*) refers to the thickened margin of the leaves, and the vernacular is the name given to the species by the aborigines. In some districts the tree is known to the settlers as the "mahogany gum."

Taken as a whole, there is nothing particularly picturesque about the appearance of a Jarrah tree or forest. Indeed, the general effect of the species *en masse* is dull, sombre, and uninteresting to the eye. Except in special spots and localities, the trees are rugged and decidedly inclined to be straggling and branchy. In this respect they differ very materially from the Karri, which is almost invariably a fine straight tree and comparatively free from branches except at the top. In general appearance the Jarrah resembles what is known in the other colonies as the "stringy-bark." Its likeness to the species of *Eucalyptus* so-called is very marked. The bark is persistent, fibrous, and of a dark grey colour, although more deeply indented in its longitudinal furrows than a true stringy-bark.

It is not uncommon to find considerable areas of Jarrah forest where many of the matured trees attain heights of from 90 feet to 120 feet, with good stems 3 feet to 5 feet in diameter, and 50 feet to 60 feet to the first branch. Such places would be described as first-class Jarrah forest. Taking an average, however, of these forests, I think a Jarrah tree of a good, healthy stamp, and one representing a fair specimen of its kind, would run about 90 feet to 100 feet in height, and from $2\frac{1}{2}$ feet to $3\frac{1}{2}$ feet in diameter at the base. Under such conditons and in fairly favourable situations, trees of this size might be expected to be sound and convertible into good marketable timber without much waste. Of course, in places there are individual trees to be met with the measurements of which run into figures far in excess of those just mentioned, and one or two of these may be cited as indicative of the possibilities of the tree as regards size and wealth of timber. One, about three miles west of the old "Wellington

Mill," upon the "Ferguson River," measured 22 feet in circumference at 5 feet up from the ground, and 80 feet to the first branch. It is a fine, straight, handsome tree, apparently perfectly sound, and would turn out at least 20 loads of good sawn timber. Another large specimen on the "Ferguson" area was 21 feet in circumference at 4 feet from the ground, and 75 feet to the first branch. And yet another, this time in the "Ironpot" area, measured 22 feet in circumference at 4 feet up, and 60 feet to the first limb. These few instances of the actual measurements of large Jarrah trees will show to what an immense size the species will sometimes attain, under what must, of course, be favourable circumstances.

As regards the age of the tree when it has attained a diameter of about 2 feet, or has reached that stage when it may be considered fit for the saw mill, I have gone carefully into this question by having trees cut down and their concentric rings counted, and have come to the conclusion that in good situations it will attain this size when about 40 or 50 years of age.

So far as my observations have extended, the Jarrah is confined in its distribution to what is known as the South-western Division of the Colony, and this, I understand, is practically its geographical limits. This district lies along the western coast of the Colony, between latitudes 31 degrees and 35 degrees south, and longitude 115 degrees and 119 degrees east. This means a stretch of country extending nearly 350 miles running north and south, and from 50 to 100 miles east and west, and embraces all that portion of the country upon which the heaviest rains of the season fall, which measure 40 inches in the south and 35 inches in the north. An average of 10 years shows the rainfall of this, the timbered district of the Colony, as 38 inches.

The Jarrah is purely a semi-coastal tree, by which I mean that it is not found anywhere strictly beyond the influence of the sea, and yet is not at all partial to the direct effects of the sea-breezes. Perhaps the best forests of the species are found from 20 to 30 miles off the coastal line. Whether this fact is only co-existent with the heavy rainfall district, and whether, with an equal rainfall more inland, the result of growth would be equally as good as along the coast, I am not prepared to say.

The principal habitat of the tree is therefore along the tablelands and slopes of the Darling Range, which runs through nearly the whole of the South-western District. Perhaps the best areas of Jarrah lie along that portion of this range from the Blackwood River north to the Helena River, with the choicest portions midway between these two points. In all cases it delights in an ironstone formation, and it would almost appear as though the rougher the site and the more it is composed of ironstone rocks and barren of almost any other vegetation, the better the tree will grow. It is certainly beyond a doubt that, under such circumstances, the timber attains its greatest degree of soundness, strength, and general durability. There are, it is true, some fine belts and patches of Jarrah forest to be found upon many of the lower-lying portions of the district referred to, where the geological formation of these is composed of ironstone, as, for instance, in the country lying between Quindalup and Karridale, the timber is good in every respect.

It is indeed asserted by some and denied by others that the timber grown on the flats is superior in its lasting qualities to that grown on the hills, but this wants further verification before being accepted as a fact. I may, however, state that I have seen some specimens of the timber which had been cut from trees grown on the flats, which were in an apparently sound condition after having been in the ground and water for over 40 years. It is very noticeable that as soon as a granite formation comes in, the Jarrah forest will fall off to a mere scrub, if it does not disappear altogether. This is a well-known fact to those who have travelled through these forests.

The late Baron Sir F. von Mueller, the great and well-known botanist of Victoria, said "the Jarrah is famed for its indestructible wood, which is neither attacked by the borings of the Chelura, Teredo nor Termite." Its resistance to white ants is remarkable, and houses built of the wood when thoroughly seasoned are almost indestructible, and have been known to exist in perfect preservation for nearly 100 years. It gets extremely hard with age, and then becomes almost unworkable, even strong nails cannot be driven into it, and, when struck, the wood rings like a bell. Altogether, it is a remarkable timber and is highly suited for outside works. Should any decay or destruction have occurred in the timber after having been years in use, it will always be found that this is confined to the sap-wood, which therefore ought always to be avoided in the construction of houses or in other works of a permanent character. Unfortunately, sufficient attention is not always paid to the seasoning of the timber, and hence disappointment sometimes ensues. When used as flooring boards, it should be specially seasoned, otherwise there will be much warping, buckling, and an unsatisfactory floor altogether; if seasoned before being laid, however, a better floor could not exist.

The weight of the wood, when newly cut, is a little over 70 lbs. per cubic foot, which is reduced to 60 lbs. when thoroughly seasoned. It is red in colour, polishes well, and is comparatively easily worked.

Some of the principal uses to which it is as yet applied are as follows:—wood-blocking, piles, jetties, bridges, boat-building, posts, furniture and railway sleepers. It makes the best charcoal of any timber in the Colony. Its adaptability for all kinds of out-door work is well known, and hence it is considered the staple timber of Western Australia. The suitability of the timber for piles or any works requiring immersion in salt or fresh water has been practically noted and is worth recording. In this office there are specimens which have been obtained from piles and girders 60 years old. These were driven and used in local harbours and bridges. When obtained for the department, the timber appeared to be perfectly sound and free from any signs of decay whatever; if anything, the wood seemed to be harder, more solid, and apparently more durable than freshly-cut timber. At all events, it seems capable of standing wear and tear for 100 years longer. From its immersion in water, it certainly appeared darker in colour compared with newly-cut timber, but no decay whatever is apparent. Pieces of this wood have been converted

into cups, card cases and other articles, and the polish which they have taken on is equal to, if it does not surpass, the finest old mahogany.

The records of this timber having lasted in the ground as fence-posts are almost without number, and need not therefore be particularised here. There are instances of railway sleepers which were laid down 18 years ago and still appear as sound as ever.

Karri.

(*Eucalyptus diversicolor*, F. Muell.)

This is the giant tree of Western Australia, if not of the whole Australian Continent. The latter remark is, however, disputed, but the assertion is made without much fear of contradiction. It is not so well known as the Jarrah, owing to the limited field of its growth and the, at present, comparative inaccessibility of its haunts.

The late Baron von Mueller was the first to give this tree its specific appellation (*diversicolor*), and this we are told by him bears reference to the paleness of the leaves upon their lower side, compared with eucalypts generally. The common or vernacular name is the aboriginal designation of the tree.

In its young stage it can hardly be beaten as a highly ornamental tree, being regular in its growth, straight and umbrageous, its leaves changing in a few years from oval to the long broad ones which mark its more matured condition. There is no doubt that this is the finest and most graceful tree in the Australian forests. When mature, and attained to large dimensions, its appearance is grand in the extreme, and in this respect at least puts the Jarrah far into the shade. The trees are almost always of straight growth, and tower skywards for great heights without having even the semblance of a branch. So marked are they in these respects that they look like a mass of upright candles. The bark is smooth, yellow-white in appearance, but not persistent like the Jarrah. It therefore peels off in flakes each year, and thus the tree has always a clean bright appearance. In consequence of this it is frequently spoken of as a "white gum," although generally known as the Karri.

The height of these trees is almost phenomenal. As a rule, an average tree may be put down at 200 feet in height, 4 feet in diameter at 3 to 4 feet from the ground, and about 120 to 150 feet to the first branch. Trees of this size are generally sound in every respect, and may be expected to turn out timber free from the usual blemishes of dry rot, gum veins, &c., to which large trees are usually subject. Trees of this size are what one usually meets with in the Karri forests, but much larger specimens are, of course, run against now and again. For instance, on the Warren River, it is not unusual to meet with trees 300 feet in extreme height, over 180 feet in height to the first limb, and from 20 to 30 feet in circumference at the base. Of course, these are exceptional cases, but still they do exist.

The finest tree of this kind which I came across was at Karridale (M. C. Davies & Co.). This is called "King Karri," and the following are some measurements taken in connection with this great specimen :—

34 feet in circumference at 3 feet from the ground.
160 feet to the first branch.
14 feet in circumference at the first limb.
Over 200 feet in extreme height.

From these figures it will be seen that the bole of this tree from the bottom to the first limb contains nearly 6,000 cubic feet of timber. This means a weight of over 40 tons in all ; that it would take one of our ordinary mills at least four days to convert it into sawn stuff ; and it would form about a quarter of the loading capacity of one of the ships which form the fleet of our present export timber trade. These figures speak for themselves. I question if there could be found appliances in the Colony at the present moment to deal with this forest monarch.

The Karri is a very rapid grower and soon attains a great height and considerable dimensions of timber. I had several cut down with the object of counting the concentric rings in the wood, and of making some measurements and observations in regard to the species generally. The following may be taken as an average of these :—

A tree on the road from Giblet's to the Vasse road was felled. It looked like a sapling in comparison with the surrounding members of the forest.

The measurements, however, were :—

Height of whole tree	153 ft.
Height to top of available timber... ...	100 ft.
Thickness of bark	$\frac{1}{2}$ in.
Diameter at 2 ft. 7 in. from the ground ...	1 ft. $11\frac{1}{2}$ in.

Age of tree, judging from the concentric rings, 35 years.
Contents of tree, say 175 cubic feet of timber.

We thus see that a forest of marketable Karri can be produced in the short term of from 30 to 40 years.

It is certainly a matter of local record that some years ago a resident on the "Warren" lived and partially raised a small family in the hollow of one of these fallen monarchs. It appears that the tree was hollow and fell, and was afterwards further worked out and lined by the enterprising settler as a dwelling for his family until such time as he was in a position to build the modern edifice which now stands not far from the site or remains of the primitive habitation. The old tree was destroyed by a recent bush fire. This specimen was said to be over 300 feet in length and some 12 feet in diameter at the base.

The Karri is strictly confined in its range to the south-western portions of the great South-Western Division of the Colony, or that part lying between Cape Hamelin on the west and the Torbay Estate near Albany on the east. Its geographical area lies within longitudes 115 degrees and 118 degrees east, and latitudes 34 degrees and 35 degrees south. This part of the country comprises the more humid portions of the temperate region of

Western Australia, where the annual rainfall is from 35 to 40 inches, so that one may safely say the tree delights in plenty of moisture. The region is purely coastal, and is very distinct in its general physical features from anything else in this way in the Colony. Here we find immense forests of trees of straight and wonderful size, springing out of a rich soil, deep and spongy. The country is sufficiently undulating to make it in some parts what may be termed hilly, but not difficult of working by road or tram. In some instances we find the tree fairly close to the sea-coast, but in such cases it is scraggy, stag-horned, and branchy, and therefore not desirable for the saw-mill, or readily convertible into timber for marketable purposes. Still it is, undoubtedly, essentially a coastal tree, but yet shy of actual contact with strong direct sea breezes. In this respect it perhaps also resembles the Jarrah, if not the *Eucalyptus* genus generally.

From aneroid readings, I found that the best Karri forests (that is, as regards size, soundness, and health of individual specimens) are to be found at elevations of from 300 to 600 feet above the level of the sea. This I found a fairly correct observation applicable to the whole area.

The timber is red in colour, and has very much the appearance of Jarrah; indeed, so like are the two, that it takes a good judge to distinguish them. It is hard, heavy, elastic, and tough, but cannot be wrought so easily. For underground or water works the timber is certainly inferior to some other kinds, especially to Jarrah; there can be no doubt about this fact, which has been demonstrated time after time in the Colony. Still, it is only fair to say that instances have been brought under my notice where posts and slabs of the timber have been known to have been in the ground for 30 and 40 years with only an ordinary amount of decay. This is certainly very puzzling, and makes one doubtful in regard to the conclusions generally which have been arrived at in regard to this timber. However, as may be seen from the comparative tests which have been made in regard to its tensile, crushing, and breaking strength, it is a timber of a very high order. We must, therefore, pending other and more general experiments, look upon the Karri timber as one best suited for superstructural works. For bridge planking, shafts, spokes, felloes, and large planking of any sort, flooring, general waggon work, beams, it is unequalled in this Colony. In lateral strength it is very much stronger than Jarrah; and for works requiring the bearing of considerable weights, such as bridges, floors, rafters, beams of various kinds, it is of great value. In our railway sheds the wood is now much in use for the construction of waggons of all sorts. It shrinks laterally, but not to any great degree in a longitudinal direction. Altogether the timber is a most valuable one. For street blocking it is most valuable, and for this purpose seems to be equal to, if not better than, the Jarrah, in that its surface, by the wear caused by the traffic, does not render it so slippery for the horses' feet. As is well known, this timber is now largely exported for the London street paving. It is also finding a ready sale in South Africa for mining purposes.

DCLXII.—MAROMBA VINE DISEASE IN PORTUGAL.

The following correspondence relates to a disease which has made its appearance in the North of Portugal. It is undoubtedly serious, but it should be possible to keep it in check if intelligently attacked :—

FOREIGN OFFICE to ROYAL GARDENS, KEW.

THE Under Secretary of State for Foreign Affairs presents his compliments to the Director of the Royal Gardens at Kew, and is directed by the Secretary of State for Foreign Affairs to transmit to him the accompanying paper respecting the vine disease in Portugal.

Foreign Office, July 14, 1899.

(Enclosure.)

HER BRITANNIC MAJESTY'S MINISTER PLENIPOTENTIARY, LISBON, to FOREIGN OFFICE.

MY LORD, Lisbon, July 7, 1899.

I HAVE the honour to report that most disquieting news comes from the vine districts of the North of Portugal in consequence of the ravages of the "Maromba," which has appeared in nearly every vineyard of the Douro region.

The "Maromba" is a parasitic disease, the course of which was noted some four years ago by Monsieur Alfred Lecocq, when it first made its appearance in Portugal in a mild form.

As yet no definite remedy has been hit upon to counteract the evil or prevent its extension, but experiments are being actively made in the district, particularly on the estates belonging to the Crown.

One of the most troublesome features of this disease is that it attacks all classes of vines, including the American, while in some localities it has even affected the chestnut and almond plantations.

I shall endeavour to obtain more detailed information from competent experts.

I have, &c.,

H. G. MACDONELL.

The Marquess of Salisbury, K.G.,
&c., &c., &c.

HER BRITANNIC MAJESTY'S MINISTER PLENIPOTENTIARY, LISBON, to FOREIGN OFFICE.

MY LORD, Lisbon, August 30, 1899.

WITH reference to my despatch, No. 30, Commercial, of the 7th ultimo, and to Your Lordship's despatch, No. 13, Commercial, of the 22nd ultimo, I have the honour to report that the Director of the Portuguese Royal Association of Agriculture has been

able to procure some specimens illustrating the vine disease "Maromba" that has been prevalent in the Douro district for some time.

These specimens have been forwarded to-day by the steamship "Arab" to Southampton, to be transmitted direct to Kew Gardens, and I have informed the Director of their despatch.

Many experiments have recently been made in this country in the hope of discovering a remedy for this disease. The most successful appears to be the use of sulphate of copper, sulphur, and lime, for powdering the vines, but there is great uncertainty as to the best method of treatment.

Should, therefore, these specimens reach Kew Gardens in good condition, it is hoped the Curators will be able to make some experiments, as their opinion on the disease would, I am sure, be greatly valued by the Portuguese Agricultural Society.

I have, &c.,

H. G. MACDONELL.

The Marquess of Salisbury, K.G.,
&c., &c., &c.

REPORT.

The living vine, forwarded to Kew for investigation, arrived in excellent condition, and enabled a thorough microscopic examination, also cultures from various parts to be undertaken.

The result of such examination proves conclusively that the disease is caused by a parasitic fungus, which in the first instance attacks the younger root branches, extending from thence into the thicker branches, and finally attacking the collar of the stem.

The mycelium first appears in the vessels of the root, which not unfrequently become filled with a dense weft of slender colourless hyphae. From thence the mycelium extends to the adjacent tissues, killing the cells and causing a brown colouration of the attacked parts. The contents of cells attacked by the mycelium assume a spherical form, being at first colourless, finally clear brown. These spheres become ruby red when treated with an alcoholic solution of alkannin, and blackish brown with a one per cent. solution of osmic acid, thus proving the oleaginous nature of their composition.

Portions of the root placed in a damp chamber soon became covered with white cottony mycelium, which gradually changed to a brown colour and passed into slender cord-like strands or rhizomorphs.

Numerous fasciculate conidiophores bearing very minute hyaline elliptic conidia were also produced from blackish microsclerotia immersed in the bark of the root.

The higher form of fruit has not been observed, as this is produced only on old and very much decayed portions of diseased plants, hence the name of the fungus cannot be given with certainty; nevertheless the general habit and morphology of the mycelium, its location in the root, the formation of radiating rhizomorphs, the sclerotia, and the conidial form of reproduction

indicate that the fungus under consideration is closely allied to, if not identical with, *Rosellinia necatrix*, Prill. and Del. (*Dematophora necatrix*, Hartig), a parasitic fungus too well known as the cause of a root disease in German and French vineyards.

Rosellinia necatrix possesses the power, attributed to the Maromba fungus, of attacking the roots of almost every kind of plant with which its mycelium comes into contact; and, when once introduced into a given district, it rapidly spreads by means of the underground rhizomorphs, which radiate in all directions in the soil from each root that is attacked.

Preventive measures.—Carbon bisulphide has proved to be a most effective remedy in preventing the spread of subterranean mycelium. Holes are made in the soil about 1 ft. deep, 1 ft. distant from the stem of the vine, and 2 ft. apart laterally; half an ounce of carbon bisulphide is poured into each hole and closed immediately with the foot. The holes are made with an iron rod. This substance, in addition, is the most effective agent known against root-lice, maggots, etc.

Carbon bisulphide is highly inflammable, and should not be exposed in the proximity of a light.

Where the disease is spreading the diseased portion should be isolated by means of a trench about 1 ft. wide and 9 ins. deep. Carbon bisulphide might be used at intervals as described above, on the presumed uninfected side of the trench, as a preventive to the extension of mycelium that may not have been included by the trench.

Weeds should not be allowed to remain, as their roots supply the fungus with food and aid the extension of its mycelium in the soil.

Diseased vines, also other plants, should be promptly removed and burned; if allowed to remain and decay *in situ*, preventive measures are practically of no avail, as mycelium and conidia are being continually produced and diffused from such centres of infection.

Finally good drainage is of primary importance; the underground mycelium extending most rapidly and proving most destructive when stagnant water is present in the soil.

G. M.

The following literature gives additional information on the subject of root-diseases:—

Root Diseases caused by Fungi. *Kew Bulletin*, 1896, pp. 1–5, 1 pl.

P. Viala, *Monographie du pourridié des Vignes*, &c. G. Masson, Boulevard Saint-Germain, 120, Paris.

J. Dufour, Dematophora necatrix. *Chron. Agr. Cant. Vaud.*, 12 (1899), No. 4, pp. 87–90.

G. Massee, *A Text-book of Plant Diseases.* Duckworth & Co., London, 1899.

DCLXIII.—CHINESE PRINTING BLOCKS.

The subject of Chinese printing blocks has for some considerable time engaged the attention of this establishment, and as the Museums have recently become possessed of several examples through the courtesy of Mr. W. R. Carles, Her Majesty's Consul at Foochow, it has been thought of sufficient interest to review the question in the Bulletin of the Royal Gardens, and hopes are entertained that specimens of all the woods and blocks prepared therefrom for this industry, together with dried specimens of the plants to satisfactorily determine their botanical origin, may be forwarded to Kew.

Application was first made to the Foreign Office early in April, 1884, for specimens of blocks prepared from the wood of the well-known Tallow-tree (*Sapium sebiferum*, Roxb.), which was supposed to be used for that purpose, and though the matter was kindly taken up by Mr. Baber, then Chinese Secretary of Her Majesty's Legation at Peking, who issued a memorandum for circulation amongst various of Her Majesty's Consuls in China, no specimens came to hand; later, Dr. A. Henry, to whom the Royal Gardens have become indebted for many interesting and unique donations, drew further attention to the subject in his "Notes on the Economic Botany of China," p. 9, under the heading of "Queries from Kew." Such in brief is the record of an interesting economic subject of which full particulars are detailed in the following correspondence :—

EXTRACT from letter from Royal Gardens, Kew, to Foreign Office, dated April 2nd, 1884.

"The wood of the well-known Tallow-tree (*Sapium sebiferum*, Roxb. Stillingia sebifera, *Michx.*) is one of those said to be used by the Chinese for printing blocks, and Sir J. D. Hooker would be glad if one of Her Majesty's Consular Officers in China could procure specimens of such blocks for the Kew Museum. He would also like to procure printing blocks in which any other kinds of wood have been used if only the nature of these can be authentically determined.

"Sir J. D. Hooker has no means of indicating in what parts of China application for these specimens might be most conveniently made. But he has no doubt that Mr. Baber would assist with his advice as he so kindly did in the case of the enquiries which Earl Granville was pleased to direct should be made in the case of Chinese White Wax."

FOREIGN OFFICE to ROYAL GARDENS, KEW.

SIR, April 24th, 1884.

YOUR letter of the 2nd instant upon the subject of the woods used in China for printing blocks was referred to Mr. E. C. Baber for his observations and suggestions, and I am now directed by Earl Granville to transmit to you the accompanying draft instructions to certain of Her Majesty's Consuls in China which has been drawn up by that gentleman.

I am to request that you will lay this draft before Sir J. Hooker and move him to inform Lord Granville whether it meets with his concurrence.

I am, &c.,
(Signed) PHILIP W. CURRIE.

COPY OF INSTRUCTIONS addressed to Her Majesty's Consuls at Canton, Kiungchow, Fuchow, Tamsui, Shanghai, Hankow, Chungkiang, and Tientsin.

SIR,

THE Director of the Royal Gardens at Kew being desirous of obtaining some accurate information in regard to the woods used in China for printing blocks, I am directed by Earl Granville to request that you will furnish his Lordship with such information on the subject as you may be able to obtain in your Consular District and will forward specimens of blocks for examination.

The wood of the well-known Tallow-tree (*Sapium sebiferum*) is one of those said to be used by the Chinese for this purpose. The Director would be glad if you could procure specimens of blocks of that wood, as well as of any other kinds of wood used in Chinese printing if only the nature of these can be authentically determined or means afforded for their identification. The better to secure the latter object, it would be well to obtain, where possible, dried specimens of the trees themselves which yield the woods, and I am to instruct you to do this where you can.

A copy of printed instructions issued by Kew Gardens for the guidance of collectors is transmitted herewith for your use.

I have, &c.,
(Signed) E. C. BABER.

EXTRACT from letter from W. R. Carles, Esq., to Royal Gardens, Kew, dated Her Majesty's Consulate, Hankow, February 15, 1896 :—

Dr. Henry, in his "Notes on the Economic Botany of China," refers to your wish to obtain specimens of the woods used in China for printing blocks.

The name which the neighbouring city of Wuchang enjoys for the excellence of its printing work has led me to inquire into the woods used there, and I am sending you specimens of them by parcel post.

The wood which is considered the best is the *t'eng li mu*, which has been identified as the *Pyrus betulæfolia*, Bunge., and which grows in this Province. Slabs of this wood 1 ft. × 6 ins. × $1\frac{1}{2}$ in. cost 150 cash, or about $5\frac{1}{2}$*d.*

A cheaper wood generally used for printing proclamations is the *tu chung mu*. *Eucommia ulmoides*, Oliv., has been determined to be the *tu chung mu*. The *tu chung* here used is a native of this Province.

A wood used in Kiangsu is the *yin hsing mu*, which is one of the names of the *Salisburia adiantifolia*.

Boxwood, *huang yang mu*, is obtained from Szechuen, but only in small pieces, which are mainly used for cutting the stamps used for private seals on letters and documents.

In the third volume of the Japanese work, the "So Moku Sei Fu," a drawing is given of the *huang yang*, together with a quotation from the Chinese Materia Medica, which speaks of the tree as growing an inch a year, except in these years which have an intercalary moon, when it grows backwards. From this it would appear to be a slow growing tree.

W. R. CARLES, ESQ., to ROYAL GARDENS, KEW, dated Her Majesty's Consulate, Hankow, July 25th, 1896.

DEAR MR. THISELTON-DYER,

I AM glad to learn from your letter of the 12th May, that the specimens of woods which I sent to you were of interest. I am sending you by post some printing blocks of the two woods (Pyrus and Eucommia), and a little stamp in box-wood.

The blocks have been given me by the Agent of the National Bible Society of Scotland. I think that the block for an illustration of an engine gives a very good idea of the usefulness of the wood.

If you would like to have these specimens further supplemented, I shall be very glad to do what I can.

Yours, &c.,
(Signed) W. R. CARLES.

W. R. CARLES, ESQ., to ROYAL GARDENS, KEW, dated Her Britannic Majesty's Consulate, Foochow, July 11th, 1897.

DEAR MR. THISELTON-DYER,

I AM sending you by post another small parcel of woods used for printers' blocks. Two of them came from Chinkiang, and are, I believe, from a species of Euonymus and *Zizyphus vulgaris*. The others are from this Province, and judging from their names are species of Pyrus. Later on I hope to be able to procure specimens of the flower and leaf of these two, but the others, I am afraid, I have no chance of determining * * *

Yours, &c.,
W. R. CARLES.

The specimens referred to in Mr. Carles' letter, dated Hankow, February 15th, 1896, and received at Kew on April 8th following, consisted of sections of the woods of T'eng li mu (*Pyrus betulæfolia*, Bunge), Tu chung shu (*Eucommia ulmoides*, Oliv.), and Huang yang mu or Boxwood (*Buxus sempervirens*, Linn.)

Further specimens received from Mr. Carles, September 25th, 1896, and described in his letter dated Hankow, July 25th, consisted of another specimen of the wood of T'eng li mu (*Pyrus betulæfolia*, Bunge), together with two engraved blocks of the same wood under the name of Huang li, also an engraved block of *Eucommia ulmoides* sent as Tu chung, and a small engraved seal of Boxwood (*Buxus sempervirens*, Linn.)

The blocks accompanying Mr. Carles' letter, dated Foochow, July 11th last, and received at Kew, August 20th, were as follows :—Two blocks of a species of Euonymus from Chinkiang, one prepared for engraving and the other engraved ready for use,

also a small block of *Zizyphus vulgaris*, from the same locality, and two other engraved blocks from Fukien, namely, *huang li* or Red Pear, which is probably *Pyrus betulæfolia*, and *pai li* or White Pear, which so far cannot be identified. It is improbable that it is furnished by a species of *Pyrus*, and may, perhaps, be furnished by a species of *Tilia*.

With the exception of the small Boxwood seal, it is interesting to note that all the other examples are engraved or prepared for engraving either on the tangential or radial surface of the wood. With European engravers the transverse surface is always the one engraved. The Museum contains several Indian stamps or designs for printing cotton cloths, each of which is cut on the transverse surface. None of the Chinese blocks seem to be of specially selected wood, nor, excepting perhaps the Boxwood, to be adapted for fine engraving.

The Chinese word *mu* means wood : *shu* means tree. The *tu chung* determined by Professor Oliver to be *Eucommia ulmoides* is a native of mountainous districts in Hupeh and Szechuan. The same name is applied apparently to a tree of the plains which is almost certainly a Euonymus. It is very improbable that the wood of Eucommia is used for printing blocks at all : the identification is probably an error arising from the name *tu chung* being applied to two different trees. The engraved block sent by Mr. Carles as made from Eucommia is almost certainly the wood of Euonymus. It is possibly identical with *pai ch'a* used largely at Ningpo for carving (see *Kew Report*, 1878, pp. 41, 42), which is now identified with *Euonymus hamiltonianus*, Wall. It is possible also that the wood supposed to belong to *Sapium sebiferum* is the same thing.

DCLXIV.—LUNGAN PULP.

Mr. Consul Kenny in his Report on the Trade of Tainan, Formosa, for the year 1896 [Foreign Office Report, Annual Series, No. 2,021] draws attention to this substance in the following words :—"Lungan is the fruit popularly known as the 'dragon's "eye.' It is prepared in the form of a pulp by peeling and "stoning the fruit and drying and baking it, and is used by the "Chinese as tea." Specimens of the fruit of the Lungan or Longan (*Nephelium Longana*, Cambess.) were already in the Museum collection, but the fruit pulp prepared in the way indicated by Mr. Kenny not being represented, application was made to the Foreign Office to request Her Majesty's Consul at Tainan to procure and forward to Kew specimens of the fruit and prepared pulp. This was accordingly done, specimens being received on September 9th, 1898, from Mr. Ernest A. Griffiths, Acting Consul, Tainan, together with a memorandum on the subject by the Rev. William Campbell, F.R.G.S., Presbyterian Missionary at Tainan, written at the request of Mr. Griffiths, and from which the following notes are gathered :—

The dried Lung-ngan or Geng-Geng, which is largely exported from An-pêng, the port of Tainan, is described as the longan fruit (*Nephelium Longana*). On page 105 of Douglas' Amoy-Vernacular

Dictionary, gêng-gêng is described as the dragon's eye or lung-ngan fruit, geng-a-koa being the dried lung-ngan (Mandarin sound of characters, as gêng-gêng is the local with us in Formosa), which is the article of export.

Natives state that the "lichi" (*Nephelium Litchi*, Cambess.) is not very common in Formosa. It is larger than the lung-ngan or gêng-gêng, has a thinner and much rougher outside husk, and contains more edible matter.

The country of Kagi is a region where much of the gêng-gêng yearly production is prepared for exportation.

The work of first heating the fruit so as to cause the soft part inside to shrink, of peeling the husk, and then of drying the abstracted soft part over a slow fire, is carried on chiefly by women and girls, who earn each about 60 or 80 cash (6–8 cents) a day, besides getting the husks and hard inner nut for use as fuel. The work usually begins about the middle of the eighth month and lasts on till the end of the year. The dried article of export is taken to Shanghai, &c., and is said to be largely used for infusion with water as a refreshing drink or febrifuge.

Lungan pulp consists of the fleshy arillus which surrounds the seed; it is of a black colour and leathery consistency, and has a sweetish smoky flavour and is of an uninviting appearance.

DCLXV.—MISCELLANEOUS NOTES.

MR. HAROLD MAXWELL LEFROY, B.A., of King's College, Cambridge, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Lecturer in Economic Entomology in connection with the Agricultural Department, West Indies. His services will be generally available for the West Indian Colonies, and his headquarters will be at Barbados. Mr. Lefroy took First Class Honours in the Natural Sciences Tripos in 1898.

MR. WILLIAM R. BUTTENSHAW, M.A., B.Sc., Aberdeen, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Lecturer in Agriculture for Jamaica.

The Department of Agriculture of the University of Aberdeen was organized three years ago, and Mr. Buttenshaw was the first student to obtain the B.Sc. degree in it.

MR. F. A. LODGE, a Deputy Conservator in the Madras Forest Department, has been selected by the Secretary of State for the Colonies, with the sanction of the Secretary of State for India, to proceed to Trinidad and furnish a full report and recommendations on the question of forest conservancy.

Mr. Thomas William Brown, formerly a member of the Gardening Staff of the Royal Botanic Gardens and late Acting Curator of the Botanic Station at Aburi, Gold Coast (*Kew Bulletin*, 1899, p. 50), has been appointed Assistant Curator.

Mr. Bernard Cavanagh, a member of the Gardening Staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, Superintendent of the Gardens of the Agri-Horticultural Society, Madras, in succession to Mr. J. M. Gleeson, deceased.

Mr. Henry Harold Welch Pearson, B.A., Assistant (for India) in the Herbarium of the Royal Botanic Gardens, has been awarded the Walsingham Gold Medal of the University of Cambridge for his account of "The Botany of the Ceylon Patanas," published in the *Journal of the Linnean Society* (Botany), vol. xxxiv., pp. 300–365.

Professor Francis Guthrie, Ll.B., B.A.—The death of this distinguished South African man of science, on October 19 last, at Cape Town, deserves a brief record.

Born in London, in 1831, he graduated with honours in the University. He was called to the Bar and engaged in Chancery practice. In 1861 he was appointed to the Chair of Mathematics in Graaf-Reinet College, which he resigned in 1876 for a similar Chair in the South African College. He retired in 1898.

A pupil of the celebrated Lindley, he devoted himself to the study of the flora of his adopted country. He had latterly been engaged with the well-known South African botanist, Harry Bolus, in an elaboration of the *Ericaceæ* for the fourth volume of the *Flora Capensis*, of which the continuation is now in course of preparation at Kew.

Sir Rawson William Rawson, K.C.M.G., C.B.—Sir Rawson Rawson, who died on November 20, 1899, at the age of 88, was one of the many Colonial Governors who have done good service to Kew and botanical science. He was, perhaps, more eminent as a statistician and geographer than a botanist, but he was joint author, with Dr. L. Pappe, of a *Synopsis Filicum Africæ Australis*, published at Cape Town in 1858. He had, before proceeding to South Africa, made a study of ferns. Sir R. Rawson was appointed Colonial Secretary at the Cape in 1854, and ten years later Governor of the Bahamas, and subsequently of the Windward Islands, retiring in 1869. During his residence at the Cape he was in frequent correspondence with the late Sir William Hooker, chiefly on questions relating to the ferns of that Colony (of which he sent specimens to Kew), but also with reference to contributions of museum objects, living plants, and seeds.

Perhaps his greatest service was the share he took in promoting the *Flora Capensis* of Harvey and Sonder. This is commemorated by Professor Harvey in the preface to the third volume :—

"Nor can the authors close this preface without a tribute of gratitude to Rawson W. Rawson, Esq., late Colonial Secretary and now Governor of the Bahamas. To the active interest which from the first Mr. Rawson took in their undertaking, and to his powerful advocacy in the Colonial Parliament, are greatly due the very existence of the Flora. Nor was his assistance limited to the greater acts of patronage which became his station, but extended to the smallest details, such as the forwarding of parcels, &c. : in every detail and on every occasion he was invariably kind and considerate."

Sir Rawson Rawson is commemorated in systematic botany by *Rawsonia*, a genus of Bixaceæ.

Botanical Magazine for October.—*Lonicera hildebrandiana* is a magnificent species from the Shan Hills and Munnepore, having been discovered in the latter locality by Dr. George Watt in 1882. It has also been met with in Dr. A. Henry's recent collections from Yunnan. It first flowered in the British Islands in the Royal Botanic Gardens, Glasnevin, but the drawing was made from a plant which flowered at Kew and which was raised from seed sent by A. H. Hildebrand, Esq., C.I.E., in 1894. *Kalanchoe thyrsiflora*, a native of South Africa, was first introduced into the gardens of Thomas Hanbury, Esq., at La Mortola, and seeds were distributed by him to various botanic gardens. The specimen figured was grown in the Botanic Garden, Cambridge. Its flowers are bright yellow, arranged in a dense erect thyrsiform panicle. The interesting *Stylidium crassifolium* was raised from seeds sent to Kew from South-western Australia by Quartermaster-Sergeant B. T. Goadby, of the West Australian Engineers. It is distinguished by long radical leaves and an inflorescence, sometimes 2 ft. long, of rose-coloured flowers. *Berlandiera tomentosa*, a pretty Composite from the Southern United States, was also raised from seeds, these having been received from the Rev. L. H. Lighthipe, of Jacksonville, Florida. Its flower-heads are 1½ to 2 ins. in diameter; the ray florets broad, and deep yellow. *Rhododendron dilatatum*, a Japanese species, is very closely allied to *R. rhombicum*. The Kew plant was procured from the Yokohama Gardeners' Association.

Botanical Magazine for November.—*Cyphomandra betacea*, commonly called the Tree Tomato, is a native of New Grenada and Peru, while as a cultivated plant valued for its edible fruit it is met with in various tropical and sub-tropical countries. It has been included in the Kew collection probably from the date of its introduction into England in 1803, and a fine specimen in the Temperate House now produces an abundant crop of ovoid orange-yellow fruits. *Carludovica laucheana*, also a native of

New Grenada, was distributed as *Salmia laucheana* by its introducers, Messrs. Sander & Co., of St. Albans, from whom the Kew plant was received. Its spadix has a curious appearance, due to the long, white, filiform staminodes, four of which are present in each of the numerous female flowers. *Hidalgoa Wercklei* chiefly differs from the only two species hitherto known in the more compound leaves. In its climbing habit and brilliantly coloured flowers, it resembles some *Mutisias*; but it is really closely allied to *Dahlia*. Kew received the plant figured from Mr. John Lewis Childs, of New York, who recently introduced it into cultivation from Costa Rica. *Begonia hemsleyana* was discovered by Dr. Henry in Yunnan. It is a new species and is remarkable in being the only known representative of the genus in the Old World with palmatipartite leaves. *Rhododendron modestum* is an exceedingly pretty new species from the Sikkim Himalaya. It appeared at Kew amongst some young plants raised from seed received from Calcutta as *R. pendulum;* but it is quite distinct from that species, and is probably nearest allied to *R. barbatum*.

New Works.—During the past year the important although not showy task of putting the working departments of the establishment into efficient order has been vigorously prosecuted by Her Majesty's Office of Works. The first step in that direction was taken in the preceding year, and the results were recorded in the *Kew Bulletin* (1898, pp. 338, 339).

The following is a list of what has since been accomplished :—

I. *Melon Ground.*—This derives its name from its former use when the frame ground of the Royal Kitchen Garden, which was abandoned by Her Majesty in 1846 and annexed to the Royal Botanic Garden. It is now the principal propagating department. No. XVIII. has been entirely rebuilt on the present Kew system of steel and wood construction. It was originally a Peach House, and a section of it is figured in Philippar's *Voyage Agronomique en Angleterre* (1830, tab. xvi., fig. 2, p. 141). The lean-to roof has now been converted into a three-quarter span. Although greatly dilapidated, much of the massive timber used in its construction was still perfectly sound. Some of the Memel Pine (yellow deal) was still perfectly sound, although it had probably been in position little less than a century. Matured pine of this kind and of great age is not now procurable. The house is divided into three compartments: one serves as a hospital for restoring to health stove plants out of condition ; the other two are forcing houses for supplying the Conservatory No. IV.

Besides this the *Mess-room* and *Tool-sheds* used by the labourers working in the northern part of the establishment have been removed from the back of Museum No. III., a position too remote from the working centre for economy of labour. A commodious office for the foreman of the decorative department has been erected. Minor appliances are an unheated span frame (84 feet long), a shed for artificial manures, another for trucks and barrows, and bins for different kinds of soil.

II. *Works' Depôt.*—This has been removed from its inconvenient and contracted position on the south side of Kew Green adjoining Cambridge Cottage to the side of Kew Palace. Commodious workshops have been provided partly by the conversion of existing out-buildings formerly belonging to the Palace, partly by the erection of new ones.

III. *Orchid-House Yard.*—This has been re-arranged. A new entrance has been made, and a proper equipment of bins for soil, a water-tank, etc., have been provided.

IV. *Herbaceous-ground Yard.*—A new north frame for alpines, 140 feet long, has been provided to take the place of others which were completely dilapidated.

V. *South Nursery.*—Two new pits have been provided :—one, single and 48 feet long ; the other a span, 67 feet long, and heated.

VI. *Water Supply.*—The severe effect on Kew of the recent series of dry summers was described in the *Kew Bulletin* for 1897 (pp. 334–6). It has been found necessary to even further extend the system of service-pipes for distributing water throughout the establishment. Further additions have in consequence been made, more especially in the Herbaceous Ground, the Rhododendron Dell, and the Arboretum.

In order to reinforce the power at the pumping station, a new high-pressure boiler has been fitted in the engine-house.

VII. The *Economic Houses* (Nos. XI. and XII.) which were erected in 1869 have been re-constructed on the mixed steel and wood principle. The roofs have also been furnished with a lantern.

Cydonia sinensis.—This quince was admirably figured and fully described by A. Thouin (*Annales du Muséum d'Histoire Naturelle de Paris*, xix., p. 144, tt. 8 et 9) in 1812, from trees cultivated in the Jardin des Plantes. According to Thouin, this tree was introduced from China into England and Holland at some time during the last decade of the eighteenth century, and the individuals cultivated in Paris were obtained by Messrs. Cels and Noisette from the countries named. But we find no record of it either in the English horticultural or botanical literature of that period. Lindley seems to have been the first (1825) to publish an account of it in this country (*Botanical Register*, xi., t. 905, under the name *chinensis*) ; and he states that he had examined ripe fruit, containing perfectly-formed seeds, produced in the neighbourhood of London ; but he only figures a flowering specimen. He describes it as a handsome, hardy, small tree, but goes on to say that it is damaged by spring frosts. Don and Loudon (1832 and 1838) seem to have had no personal knowledge of this species of *Cydonia ;* the latter merely copying the description of the former. When it disappeared from English gardens, if it has done so entirely, is uncertain ;

but it must be long since it was in cultivation at Kew. On the Continent, and especially in the Mediterranean region, it appears to have held its own from Thouin's time down to the present day ; and specimens of the fruit brought by the Director from the garden of Commendatore Hanbury at La Mortola, near Ventimiglia, revealed the fact that the quince long cultivated at Kew under the name of *Cydonia sinensis* is not the true plant, which is characterised by having ovate-lanceolate leaves furnished with glandular teeth and glandular hairs on the petioles, and a cylindric fruit, 5 to 7 inches in length. Besides the original figure, cited above, there is one in Duhamel's *Traité des Arbres et Arbustes*, vi., t. 75 (1808–1835) ; another in the *Herbier Général de l'Amateur*, ii., t. 99 (1817), and a third in the *Revue Horticole*, 1889, p. 228. In the last both flowers and fruit are in colours. It is there stated that the climate of Paris is rarely sufficient to bring the fruit to maturity ; it is not surprising, therefore, that it has disappeared from the neighbourhood of London.

When compiling the Enumeration of Chinese Plants (*Journal of the Linnean Society*, xxiii., p. 256) in 1887, with very imperfect material before us, we took it for granted that the plant cultivated at Kew was a variety of *Cydonia sinensis*, although, as there noted, it had much narrower, less hairy leaves than that originally described and cultivated. Following Bentham and Hooker's *Genera Plantarum*, *Cydonia* was reduced to *Pyrus*, and *C. sinensis* was named *Pyrus cathayensis*, Hemsl., because the names *sinensis* and *chinensis* had been applied to at least three or four species of *Pyrus* proper. On the whole it seems better, in accordance with the views of many contemporary botanists, to restore *Cydonia* to generic rank, and the species under consideration is then correctly designated *Cydonia sinensis*, Thouin (syn. *Pyrus sinensis*, Poir. in *Lam. Encycl. Suppl.*, iv., p. 452, non Lindl. nec Auct. alior. plur. ; and *Pyrus cathayensis*, Hemsl., *loc. cit. pro parte*). Thouin, under his original description, cites the names *Pyrus sinensis*, Mus. Par. and *P. Cydonia sinensis*, Wiegers, as synonyms.

The plant cultivated at Kew under the erroneous name of *C. sinensis* may be called *C. cathayensis*, Hemsl. Dr. A. Henry has sent specimens of the same species direct from China, and a figure and description of it will appear in Hooker's *Icones Plantarum*, plates 2,657 and 2,658.

W. B. H.

Oxalis esculenta.—Under this name there appeared in *Dr. Neubert's Garten-Magazin*, 1898, 196, a figure of the tubers of an *Oxalis* which was recommended for cultivation in lands which had become no longer suitable for potato-growing. A quantity was procured and grown in the open ground at Kew ; the species proved to be an old and well-known garden plant, viz., *O tetraphylla*, Cav. (O. Deppei, *Schlecht.*), a native of Mexico.

The tubers should be planted in spring, from 3 to 5 inches apart, taken up in November and stored in dry sand in a cool

place free from frost. They should be cooked in salt water and served with melted butter and cream. The writer in the publication above quoted says they are "as good as artichokes."

Wissadula rostrata.—This is a malvaceous undershrub, native, originally, of the West Indies and South America, and occurring also in Tropical Africa (perhaps introduced), and naturalised in India. Roxburgh (*Flora indica*) says :—"the bark of this abounds in serviceable flaxen fibres, and as it shoots quickly into long single twigs, particularly if cut near the earth, it answers well for procuring the fibre of a good length for mat factories."

Under the synonymous name of *Abutilon periplocifolium* it has been made the subject of experiment by Mr. Hart, the Superintendent of the Royal Botanic Gardens, Trinidad. The following correspondence gives the result.

SUPERINTENDENT, Royal Botanic Gardens, Trinidad, to ROYAL GARDENS, Kew.

Botanical Department, Trinidad,
October 10, 1899.

SIR,

AMONG our experiments is one made with *Abutilon periplocifolium* to determine if possible whether it can be profitably grown as a fibre plant.

I send a case of specimens, part of which I should be glad if you would utilise for your Museums, and part I should be glad if you would submit to some of your friends for valuation, both as strippings and when retted. Two stems are sent to show how straight they grow, and how easily the stripping can be performed.

1. Seed sown March 15th, 1899.
2. Crop cut April 28, 1899.
3. Yield per acre, raw strippings, dried (as sent), 1,089 tons.
4. Yield per acre of clean bast fibre, $9\frac{1}{4}$ cwts.
5. Cleaned material retted four days, then scraped and dried.
6. Clean material, 42 per cent. of raw strippings.

I am, &c.,
(Signed) J. H. HART.

The Director,
Royal Gardens, Kew.

Messrs. IDE AND CHRISTIE to ROYAL GARDENS, Kew.

72, Mark Lane, London, E.C.,
November 8, 1899.

REPORT.

WE have examined the undernoted and find as follows :—
Abutilon periplocifolium from Trinidad :
Bundle raw skins, no value.

Fibre from above :—Length very good ; colour good, white ; strength poor ; preparation imperfect ; similar to China Jute but softer ; value per ton, £15 16*s*. Will sell fairly well. Suggest trial 50 tons promptly.

(Signed) IDE & CHRISTIE,
Brokers.

Musa Ensete.—James Bruce's travels in 1768 to 1773, to discover the sources of the Nile, led to the discovery of a number of remarkable plants, of which he gave exceedingly good figures, though he declined to accept the views of his botanical friends on their affinities. Among them was *Musa Ensete*, which he describes under the name now adopted as specific (and subsequent writers as Ansett), and adds : "Some who have seen my drawing of this plant, and at the same time found the banana in many parts of the East, have thought the Ensete to be a species of *Musa*. This, however, I imagine, is without any sort of reason." In 1852, and again in 1853, Mr. Walter Plowden, then H.B.M. Consul at Massuah, sent plants of this *Musa* to Kew, but they did not arrive in a living state. Later in 1853 he sent seeds, from which plants were raised, one or more of which flowered in 1860, and a figure of the species was published in the *Botanical Magazine* for January, 1861 (tt. 5223-5224). In five years, in one case, in another, in three, these plants attained a height of nearly 40 feet to the summit of the foliage ; the blades of the leaves being 17 to 18 feet long. From the description in the *Botanical Magazine* it would appear that ripe fruit and perfect seeds were produced at Kew ; but it is more probable that that part of the description was made from the material supplied by Mr. Plowden. At all events the fruit is very little known in this country, and it is also imperfectly and incorrectly described in the monograph of the genus. Indeed, we know of no illustration of a fully developed infructescence, and nearly all the published figures of the habit and flowers have been copied from the *Botanical Magazine*. But what gave rise to this note was an application to Kew from several persons for the name of the fruit of a *Musa* cultivated in the Azores. Only single fruits—not a whole cluster or complete infructescence—were sent, and therefore the species could not be determined with certainty. Subsequently, Mr. J. B. Thomas, of Covent Garden, sent an entire cluster of fruit, from the same source. This is almost spherical in shape, and was originally nearly 3 feet 6 inches in circumference, borne on a peduncle about 6 inches in diameter. The weight, after hanging a fortnight in a very dry chamber, was 20 pounds. The largest of the individual fruits were 3 inches long, and nearly an inch and a half in diameter in the thickest part. Very few of them contain mature seeds ; the total number in the cluster being between 500 and 600. The pericarp is not coriaceous, as it has sometimes been described, but tender, soft, watery and tasteless, and in colour and consistence similar to a rotten apricot, as described by Bruce himself. It is quite uneatable (*see* H. H. Johnston, *Kilimanjaro Exped.*, p. 332). On the other hand, it may be mentioned, the interior or

axis of the plant, before the flowering period, is one of the best of all vegetables, and is, or was, an important article of food in Abyssinia.

A figure of Mr. Thomas's specimen was given in the *Gardeners' Chronicle* for 1900 (xxvii., p. 69, fig. 22).

The Flora of Roraima, British Guiana.—Roraima, that picturesque and interesting mountain, visited by so many naturalists, but the summit of which till late years had remained inaccessible, is now partly within the recognised boundaries of British Guiana. It was partially explored by Sir Robert Schomburgk in 1838, when he discovered, among other things, the remarkable *Heliamphora nutans* (Sarraceniaceæ). In company with his brother, Dr. Richard Schomburgk, he visited the same region again in 1842. Since then various travellers have been there; some for scientific purposes; others for the commercial exploration of its singular and varied natural productions. In 1884 another exploring expedition, in which Everard im Thurn, Esq., C.M.G., took part, spent some time in investigating the botany and zoology of this remarkable sandstone monument, which he was the first to ascend; and the botanical results were published by Prof. D. Oliver in the *Transactions of the Linnean Society*, *Botany* 2nd series, ii., pp. 249–300, tt. 37–56. In this paper three new genera and upwards of 50 new species are described. It was hardly to be expected that subsequent expeditions should be so fruitful in novelties; yet Messrs. F. V. Mc Connell and J. J. Quelch, who were there in 1894 and 1898, brought home a collection of dried plants hardly less rich in novelties, which are now being worked out at Kew, and will be published in the *Transactions of the Linnean Society*, illustrated at the expense of Mr. Mc Connell. This compact little collection consists of about 360 species, including one new genus of Compositæ and 70 new species. Among the most interesting are new species of the genera *Passiflora*, *Didymopanax*, *Sciadophyllum*, *Didymochlamys*, *Heterothalamus*, *Stifftia*, *Ardisia*, and *Lisianthus*.

The Flora of St. Vincent, West Indies.—In the *Bulletin* for 1893, pp. 231–296, an enumeration is given of all the flowering plants and ferns known to inhabit the island of St. Vincent, and, as there explained, our previous knowledge of the flora of the island was almost entirely due to the labours of the Rev. Lansdown Guilding. Comparatively little is known of the life of this gentleman, who was a correspondent of the late Sir William Hooker. It is supposed that he was born in St. Vincent, and from a letter in the Kew correspondence, written by his brother John, it appears that he died in Bermuda on the 22nd of October, 1831, at the early age of 33. He was evidently an ardent naturalist and a skilful draughtsman and colourist. A number of his drawings were reproduced by Sir William Hooker in the *Botanical Magazine* and other publications. Noteworthy among them are the admirable figures of the Bread fruit (*Bot. Mag.*,

tt. 2869–2871). Another may be mentoned, namely, *Guildingia psidioides* (Hooker's *Bot. Miscel.*, i., p. 122, t. 30), now reduced to *Mouriria*. L. Guilding was also the author of a number of papers on various branches of natural history, and he had collected materials and made drawings with the intention of publishing a Fauna of St. Vincent. Indeed, from the correspondence preserved at Kew, he must have made very extensive collections, which his widow subsequently brought to London for disposal. His brother, in the letter referred to above, states that he valued his museum at £10,000. So far as we know, the whole of his collection of dried plants was acquired by Sir William Hooker, and they now form part of the Kew Herbarium. After the lapse of 70 years, two large volumes of his botanical drawings have come to light, and have been purchased from a grandson, and presented to Kew by the Bentham Trustees. They consist largely of economic plants, including a number of varieties of the breadfruit, and are beautifully executed. There are also among them the original drawings of views in the Botanic Garden of St. Vincent, which served to illustrate Lansdown Guilding's guide to the garden.

The New Territorial Arrangements in the Pacific.—Consequent on the agreement between the Governments of the United States of North America, of Germany, and of England, there are some important changes in the respective spheres of influence in the Pacific. England renounces all claims on the Samoan or Navigators' Islands, and, in exchange, has obtained protectorate rights over the Tonga or Friendly Islands, and two additional islands, Choiseul and Ysabel, of the Solomon group. Dr. F. Reinecke anticipated Mr. W. B. Hemsley in a Flora of the Samoan Islands (Engler's *Botanische Jahrbücher*, xxiii., pp. 237–368, and xxv., pp. 578–708), the latter being engaged on the same subject when the first part of Dr. Reinecke's work appeared. From comparisons made, Kew probably possesses a number of plants not included by Dr. Reinecke; on the other hand, his enumeration contains some evidently not represented in the Kew Herbarium. The Kew collections from the Samoan group, were, to a very large extent, made some 20 years ago by the Rev. Thos. Powell, whose excellent specimens are accompanied by copious notes. It is unfortunate that the general work of the Herbarium prevented the earlier elaboration of the results of his exertions. However, there are few plants peculiar to this group of Islands. The same may be said of the Tonga group; an account of the Flora of which, by Mr. W. B. Hemsley, will be found in the *Journal of the Linnean Society*, xxx. (1894), pp. 158–217. Shortly after this paper was in print, Kew purchased a collection of plants made in the island of Vavau by C. S. Crosby, Esq., M.A., Cantab. This has been partially elaborated by Mr. I. H. Burkill; but more pressing work has prevented its completion and publication. Mr. Hemsley's enumeration contains 290 species of assumed indigenous vascular plants, but very few of these were from the island of Vavau.

Mr. Crosby's collection adds a considerable number of species undoubtedly indigenous to the Friendly Islands, and at least

half-a-dozen that have been regarded as previously undescribed. Widely different is the Flora of the Solomon Islands, which is rich in singular endemic species, and also contains some of the specially Polynesian types only known to exist elsewhere in such distant parts as the Society Islands. For what is known of this interesting Flora, Kew is principally indebted to H. B. Guppy, Esq., M.B., author of *The Solomon Islands and their Natives*, in which work will be found, pp. 280–307, an interesting account of the vegetation and vegetable products, and a list, furnished by Kew, of the plants collected by the author. Since that date (1887), many interesting additions have been made to the flora by some of the officers, Lieutenants B. T. Somerville and S. Weigall, of H.M.S. "Penguin," and the Rev. R. B. Comins, who, in spite of arduous missionary duties, has made many noteworthy botanical discoveries. Some of the principal novelties will be found described in the *Bulletin*, 1894, pp. 211–215 ; 1895, pp. 132–139 ; in the *Journal of the Linnean Society*, xix., pp. 293–297 ; xxx., pp. 163–165, and 211–217 ; in the *Annals of Botany*, v., pp. 501–508, and vi., pp. 203–210, and the *Journal of the Linnean Society*, xxxii., pp. 479–489. Most of the articles are illustrated.

Jamaica Botanical Department.—A detailed account of the history and organisation of this important Department is given in Dr. Morris's "Report on the Economic Resources of the West Indies" (*Kew Bulletin, Additional Series*, I., pp. 137–148).

The following account of the recent work of the Department is taken from the last report of the Jamaican Government presented to both Houses of Parliament :—

EXTRACT from Colonial Reports, Annual, No. 283, Jamaica, Report for 1898–9, pp 31–32.

The Botanical Department did useful work during the year in experimental cultivation, in the distribution of plants and seeds, and in affording information by means of bulletins and private correspondence with planters.

The Department distributed during the year no less than 197,139 plants, of which the greater proportion were economic plants.

Advice was given during the year to orange growers as to remedies for sickly plants, to cocoa planters by leaflets and demonstrations by the Agricultural Instructor of the Department, to viticulturists through the Instructor, whose advice given during the last few years has resulted in remunerative cultivation of grapes for the home market in a dry district of St. Elizabeth, hitherto considered of little value for agricultural purposes, to sugar planters by distributing the best varieties (the "No. 95" variety having afforded a planter more than double the yield of the kind hitherto grown on his estate), to tobacco cultivators by obtaining the best kinds of the famous Vuelta Abajo tobacco, with which the Hon. Evelyn Ellis exclusively planted out 60 acres, manufacturing tobacco which realized a high

price in New York. This has induced him to lay out 130 acres more. The Department has also had under training two lads from the Colony of Lagos, and has trained as agriculturists several lads from the Hope Industrial School.

A scheme for starting an experimental agricultural station was formulated during the year by the Botanical Director, the Agricultural Inspector, and the Principal of the High School at Hope for the employment and instruction of industrial school boys, and of boys whose parents are willing to pay for their maintenance. The scheme was approved by the Government, but cannot at present be carried out for want of funds.

The great rise in the beginning of 1899 in the price of quinine and cinchona bark led to an enquiry into the present condition of the cinchona plantations and the practicability of manufacturing quinine locally as in India. As a result it appears doubtful, unless prices rise still further, whether bark can be harvested for sale, or quinine manufactured locally, as a source of profit.

Grape Fruit.—A brief notice of this fruit which has become an important article of export from the West Indies to the United States, where it is very popular, was given under the head of Bahamas in the *Kew Bulletin* for 1898 (p. 180).

The following further particulars are taken from Dr. Morris's "Report on the Economic Resources of the West Indies" (*Kew Bulletin, Additional Series*, I., p. 150) :—

"The grape-fruit is a member of the orange tribe that has lately come into great favour in the United States. It is a fruit allied to the shaddock (*Citrus decumana*), but smaller, and with a finer flavour. It is regarded as very wholesome and refreshing, and possessing valuable tonic properties. Fortunately trees yielding this fruit were already plentiful in Jamaica, and the island was at once able to meet the demand. Last year the value of the exports was nearly £6,000. It is probable that it may eventually be more profitable to grow the grape-fruit than the orange."

A question has arisen as to whether the grape-fruit, being apparantly only a cultivated race, would come true from seed. The following letter seems conclusive on this point :—

F. B. ARCHER, ESQ., M.B., C.M., Barbados, to COMMISSIONER OF AGRICULTURE FOR THE WEST INDIES.

Culloden, St. Michael,
October 21, 1899.

DEAR DR. MORRIS,

WITH reference to our conversation about grape-fruit, my experience is as follows :—

When in Demerara some years ago I tasted some most delicious ones at Mrs. Jacobson Hill's, grown in her own garden. I very much desired a plant, and she gave me some of the fruit so that

I could plant the seeds, but I told her very likely they would not come true. I planted the seeds here, and have five trees which have borne fruit twice or more, and to my delight they come true to the parent plant.

They are as fine or finer than any grape-fruit I have ever tasted.

I got no fruit last year on account of the storm, and for some reason they are not bearing this year, but should they give any fruit next year you shall taste for yourself.

I am, &c.,

(Signed) F. B. ARCHER.

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